AD-A115 323   NAVAL OCEANOGRAPHY COMMAND DETACHMENT ASHEVILLE NC   F/G 4/2

CLIMATIC STUDY OF THE MALACCA AND SUNDA STRAITS, NEAR COASTAL Z--ETC(U)

APR 82

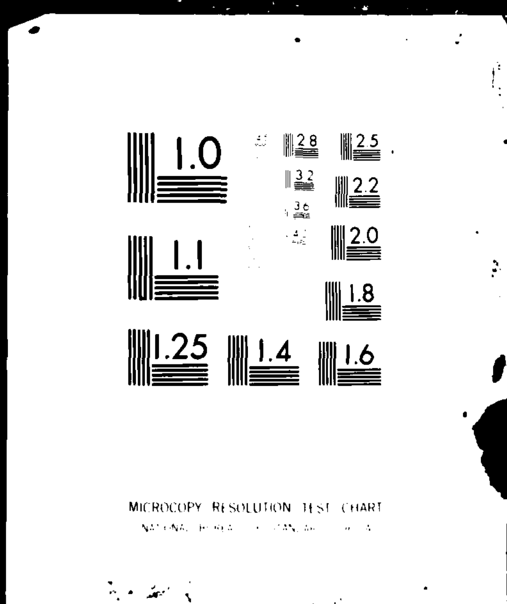
UNCLASSIFIED   NL

1 OF 3

AD A
115323

1 OF

AD A
115323



95° 100° 105° 110°

AD A115323

1

"Original contains color plates: All DTIC reproductions will be in black and white"

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)

Climatic Study of the Near Coastal Zone
Malacca and Sunda Straits

5. TYPE OF REPORT & PERIOD COVERED

Reference report

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Naval Oceanography Command Detachment
Federal Building
Asheville, NC 28801

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS

Commander
Naval Oceanography Command
NSTL Sta, Bay St Louis, MS

12. REPORT DATE

April 1982

13. NUMBER OF PAGES

178

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

15. SECURITY CLASS. (of this report)

Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Climatology, visibility, ceiling, surface wind, air and sea temperature, wave heights, surface currents, monthly climatology, coastal zone.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This climate study consists of monthly charts and tables of (1) visibility, (2) ceiling-visibility (low), (3) ceiling-visibility (mid-range), (4) scalar mean wind speed, (5) wind speed $<$ 11 and $\geq$ 34 kts, (6) wind speed 11-21 and 22-33 kts, (7) surface wind roses, (8) air and sea temperature, (9) wave height isopleths, (10) wave height tables and (11) surface currents (seasonal).

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

S/N 0102-LF-014-6601

UNCLASSIFIED

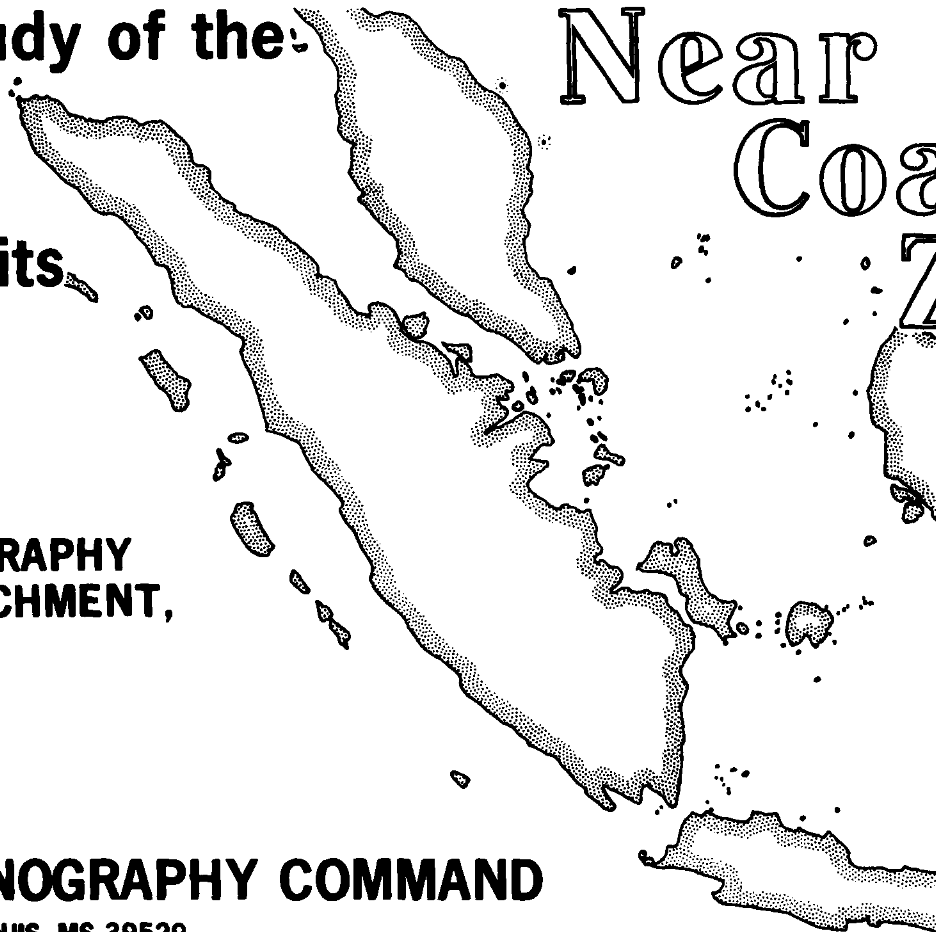
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

S/N 0102- LF- 014- 6601

UNCLASSIFIED

Climatic Study of the Malacca and Sunda Straits

Near Coastal Zone



i/ii

PREPARED BY
NAVAL OCEANOGRAPHY COMMAND DETACHMENT, ASHEVILLE, N.C.

PREPARED FOR
COMMANDER
NAVAL OCEANOGRAPHY COMMAND
NSTL STATION, BAY ST. LOUIS, MS 39529

UNCLASSIFIED

This near-coastal zone study was prepared by direction of the Commander, Naval Oceanography Command and coordinated by the Naval Oceanography Command Detachment, Asheville, North Carolina. Work was performed by the National Climatic Center (NCC).

Introduction

The climate within the study area is largely controlled by the two distinct monsoon seasons: the northeast monsoon (December through March) and the southwest monsoon (April through November). The principal transition months or inter-monsoon periods are April through May and October through November. Figure 1 shows the mean equatorial trough and vector mean winds for January and July. This gives some idea as to the annual displacement of the equatorial trough and the prevailing winds for the two distinct monsoon seasons.

Since the equatorial trough moves across the equator once in a northerly direction and once in a southerly direction each year, it is understandable that many locations report a double maximum for precipitation. Many of the double maximums occur in May and November, but occasionally occur in preceding or following months. For more detail, the seasonal distribution of mean rainfall and air temperatures (Figure 2) and annual rainfall amounts (Figure 3) are shown for selected stations.

Latitude is one of the most important factors influencing climate. Being close to the equator, conditions vary little from the mean, and climatology is fairly representative of expected conditions. Within the study area, local climates vary more because of local topography and local wind effects. These factors influence thunderstorm development and propagation. In general, an equatorial monsoon climate brings uniformity of precipitation, humidity, and temperature; and, on a comparative worldwide scale, these three elements are found on the upper end of the scale.

Geographical and Data Coverage

This study covers the marine areas leading into and out of the Strait of Malacca and Sunda Strait. It is significant that this area (10°S to 7°N) is divided by the equator. North of the equator the east-west coverage is from 92°E to 107°E, while south of the equator it is from 90°E to 112°E. The surface marine statistics are presented on monthly charts in the form of tables, graphs, and isopleth maps. Tables and graphs by one-degree quadrangle have been split into two areas of slightly smaller geographical coverage: Strait of Malacca, 1°S to 7°N, 94°E to 105°E; Sunda Strait, 10°S to 2°S, 99°E to 110°E.

To supplement the isopleth maps and the one-degree graphs and tables, four representative areas were chosen and additional statistics given. These presentations have been placed in the lower left corner of the isopleth charts. All of the graphs and tables represent the objective compilation of available data; they were not adjusted for suspected biases, and differences may be found when comparing the graphic data with the isopleth analyses.

Approximately 620,000 surface marine observations were used in computing the statistics. These data, taken from NCC's Tape Data Family 11 (TDF-11), contain data collected by ships of various registry traveling through the study area between 1854 and 1979. Inventories of the NCC data set show that most ocean regions of the world have the largest percentage of their observations taken after 1940; but in this case 60% of the observations were taken prior to 1940. As a rule, earlier observations do not contain as many elements as more recent ones. The sea surface current information was extracted from Naval Oceanographic Office Special Publications 1404-IN2 and 1404-IN4, Surface Currents Northeast Indian Ocean Including the Bay of Bengal, Andaman Sea and South China Sea and Surface Currents Central Indian Ocean, respectively.

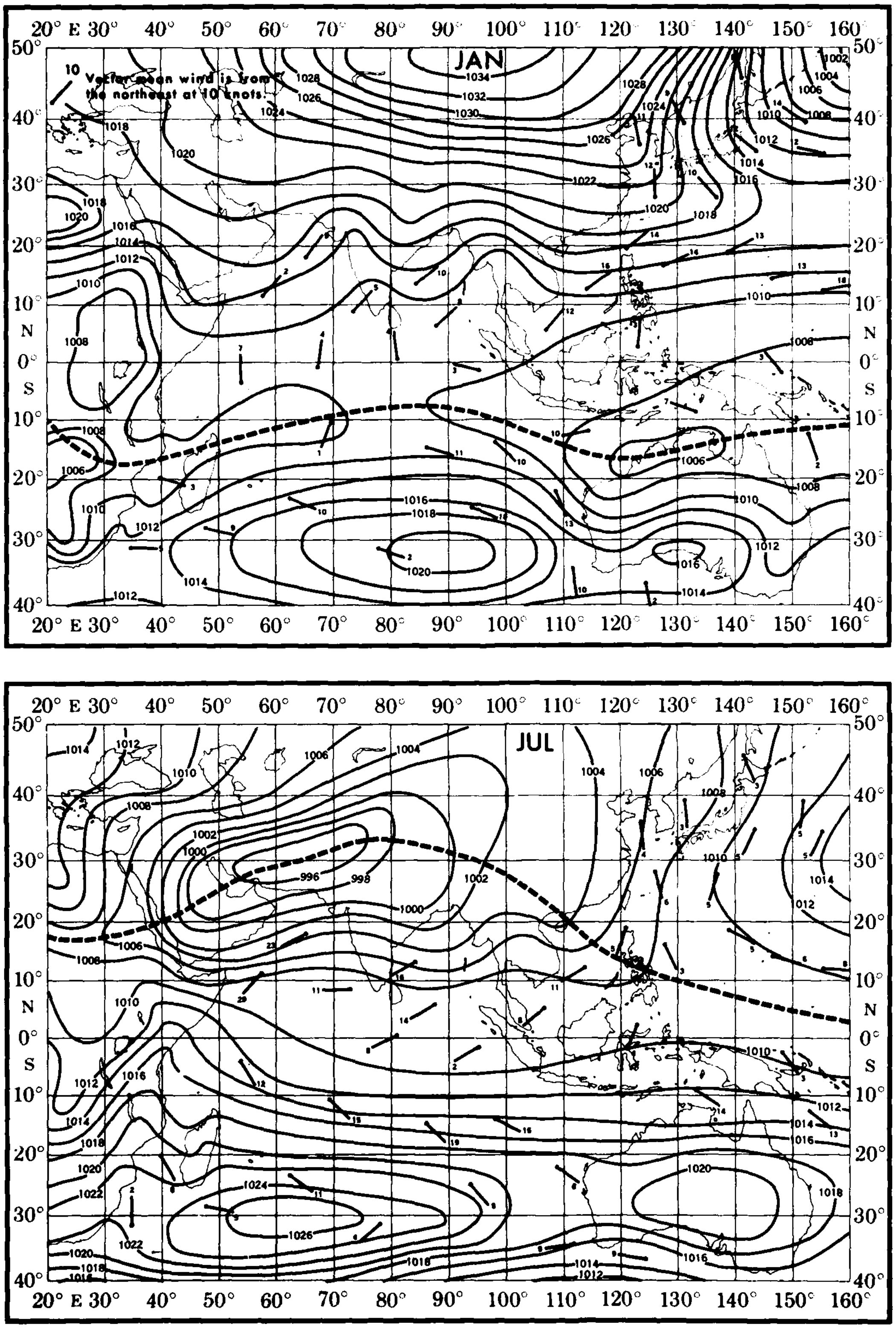


Fig. 1 MEAN EQUATORIAL TROUGH AND VECTOR MEAN WINDS

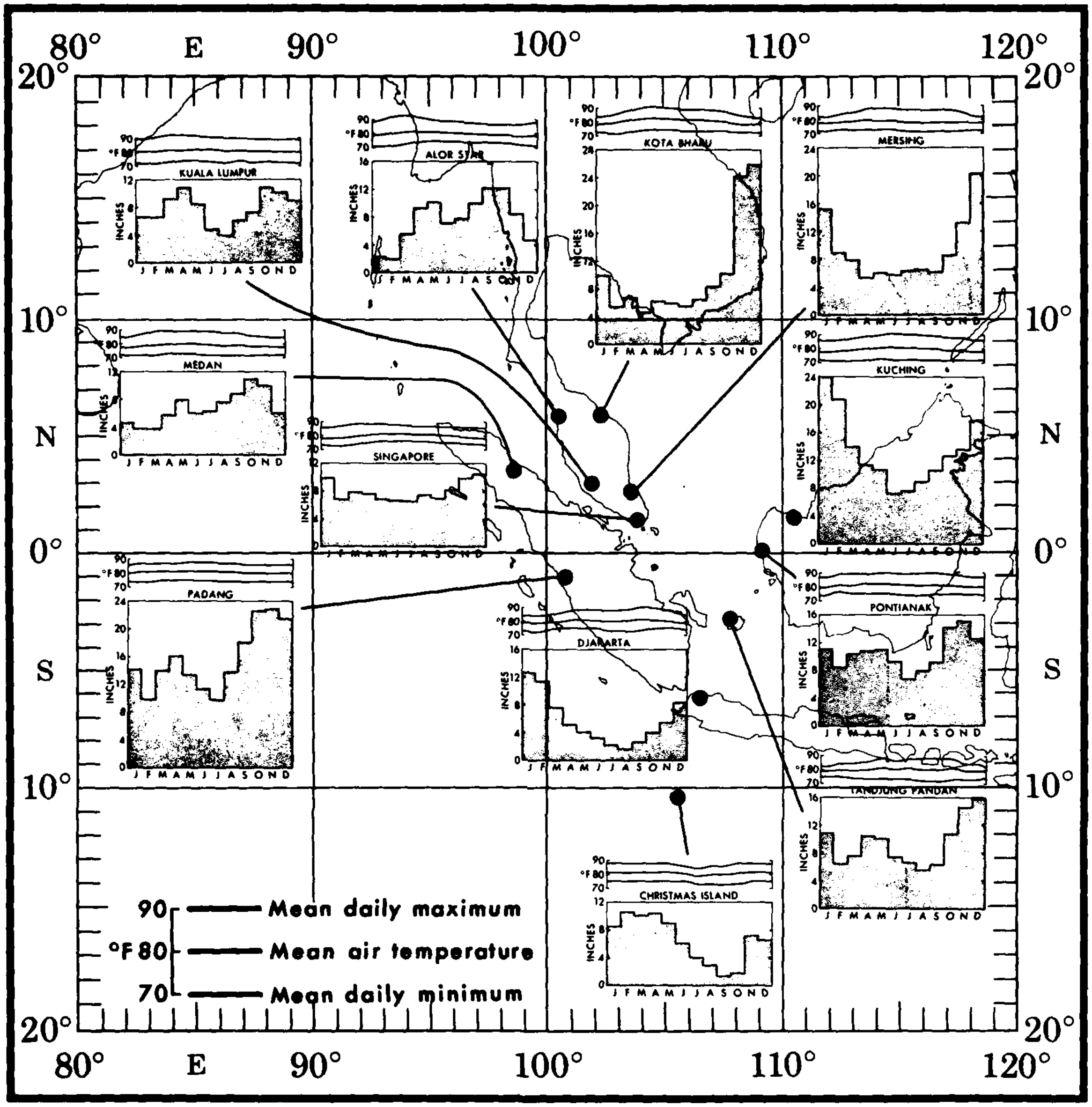


Fig. 2 MONTHLY MEANS OF AIR TEMPERATURE AND RAINFALL

The density of observations is greatest along the major shipping routes and, therefore, the reliability is better in those more-traveled areas. In this region, most of the shipping was in and out of the Malacca Strait providing relatively good coverage, while rather weak coverage is the rule for the remaining areas, especially the region to the west of Sumatra.

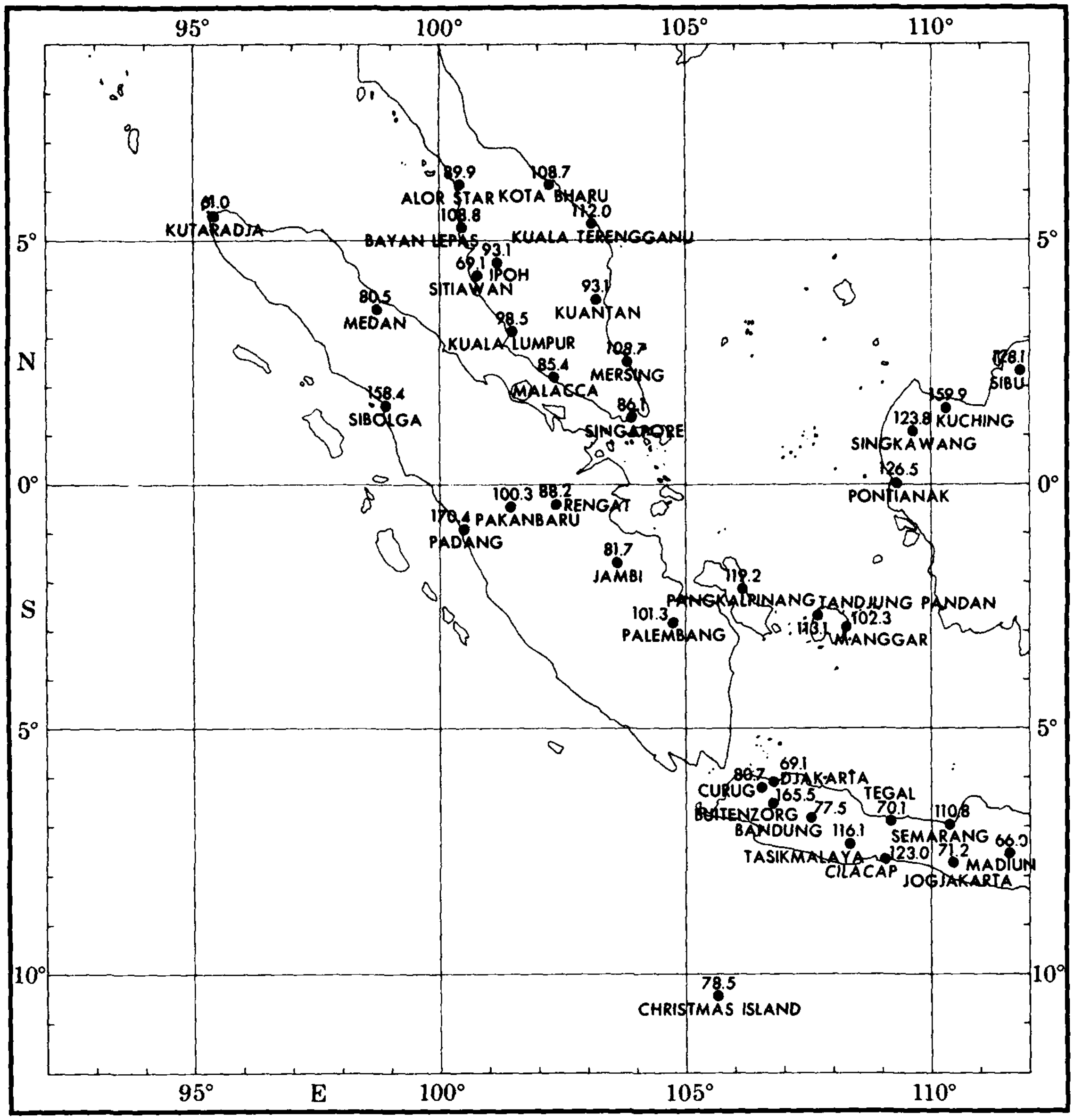


Fig. 3 MEAN ANNUAL RAINFALL (inches)

Physical Features

The Malacca Strait is the highly-traveled channel between the island of Sumatra and the Malay Peninsula that provides passage for trade between the Indian Ocean and the South China Sea. The strait is approximately 500 miles long, varying in width from 40 miles in the south to 300 miles in the north. The depth of the strait ranges from six to 60 fathoms. Also, the southern entrance is restricted to narrower passages by the numerous islands off Singapore. The main connecting route between the Malacca Strait and the South China Sea is through the Singapore Strait which is approximately 10 miles wide by 50 miles long.

Another route between the South China Sea and the Indian Ocean is through the lesser-traveled Sunda Strait which lies between the islands of Sumatra and Java. The channel actually connects the Java Sea, which is a part of the Pacific Ocean (as is the South China Sea), and the Indian Ocean. It is only 16 miles wide at its narrowest point. Depths through the Sunda Strait run from seven to 28 fathoms.

Sumatra, the Malay Peninsula, Borneo, and Java are the major land features in the study area. Sumatra lies on the west side of the Malacca Strait stretching some 1,060 miles in length and with a maximum width of 248 miles. Along its west coast, the Barisan Mountains extend the length of the island containing many peaks from 6,000 feet to 12,000 feet high with the highest being 12,483 feet. Across the Malacca Strait from Sumatra is the Malay Peninsula extending from Thailand to 2°N. The Peninsula also has a mountain range extending down its full length. The highest peak, Tahan, is 7,186 feet; several of the peaks between 3°N and 6°N are near 7,000 feet.

Java lies to the southeast of Sumatra across the Sunda Strait. The island is 661 miles long and 124 miles wide at its widest point. Mountains extend the length of the island with more than 20 peaks extending abve 8,000 feet. The highest peak located on the eastern end of the island is 12,060 feet.

East of Sumatra and north of Java lies Borneo, the largest land mass within the study area. It is rather mountainous in the north and central part with the highest peak of 13,455 feet being located in the northeastern corner, outside the study area. Peaks on the western side of the island are from 5,000 feet to 7,000 feet.

Climate

The climatic regime is equatorial monsoon. Uniformity throughout the year, high temperatures, high humidities, and abundant rainfall best describe its characteristics. It differs from most tropical monsoon climates in its lack of a truly dry season. Seasonal monsoon winds are defined as blowing consistently from one direction during the winter and another direction during the summer. They are caused by the temperature variations between large land masses and the sea. During the warm season, the land (in this case Asia) is much warmer than the sea with resultant low pressure over land; with the reverse during the colder season. This pressure distribution causes the seasonal wind flow known as the monsoon.

A general definition of a monsoon has been adapted from Ramage (1971). It defines the monsoon area as encompassing regions with January and July surface circulations in which:

1. The prevailing wind direction shifts by at least 120° between January and July.

2. The average frequency of prevailing wind directions (in quadrants) exceeds 40% in January and July.

3. The mean resultant wind speed in at least one of the months exceeds 3 m sec^{-1}; and,

4. Fewer than one cyclone-anticyclone circulation alternation occurs every two years in either month in a 5° latitude-longitude rectangle.

By "squaring off" and using the south Asian mountains as a natural northern boundary, the only region to meet all of the above criteria is enclosed by 35°N, 25°S, 30°W, and 170°E.

The four representative areas were examined to determine how well they meet these monsoon criteria (see representative statistics). The prevailing winds shifted by at least 120° between January and July for all four areas. To examine the second criterion the eight-point wind scale was adjusted into a four-point system by simply adding adjacent categories together. The results are given in Table 1 below:

TABLE 1

		Prevailing Quadrant	Percent Frequency
Area 1	January	N-NE	71%
	July	S-SE	59%
Area 2	January	NE-E	44%
	July	SE-S	35%
Area 3	January	NE-E	77%
	July	S-SW	80%
Area 4	January	W-NW	52%
	July	E-SE	63%

The second stipulation was met by all except Area 2, which departed marginally from 40%. It must be understood that the orientation of the quadrants could have some bearing on the outcome of this examination, ours being only one expedient method.

Table 2 shows the mean resultant wind speeds for the representative areas used to test the third constraint. Again, Area 2 fails the criteria.

TABLE 2

		Mean Resultant Direction	Mean Resultant Speed
Area 1	January	15 degrees	6.6 knots (3.4 m sec^{-1})
	July	164 degrees	4.3 knots (2.2 m sec^{-1})
Area 2	January	43 degrees	3.5 knots (1.8 m sec^{-1})
	July	177 degrees	1.3 knots (0.7 m sec^{-1})
Area 3	January	64 degrees	8.8 knots (4.5 m sec^{-1})
	July	218 degrees	11.5 knots (5.9 m sec^{-1})
Area 4	January	298 degrees	5.3 knots (2.7 m sec^{-1})
	July	126 degrees	7.6 knots (3.9 m sec^{-1})

The wind constancy is relatively low for Area 2 at 53% during January and 24% during July, reflecting a variable wind direction. In the same light, the scalar mean winds are also relatively light averaging 3.3 m sec^{-1} in January and 2.8 m sec^{-1} in July. Even if Area 2 had a high constancy, it is doubtful the third constraint would have been met with such low scalar mean wind speeds.

The fourth requirement is met by all areas, as substantiated by Klein (1957) where monthly charts show the number of cyclones' and anticyclones' centers for 20 years by five-degree square. Migratory cylones and anticyclones rarely appear in the lower latitudes.

In the monsoon definition there are no precipitation considerations such as a dry or wet season. For example, the Sahara Desert falls within the defined monsoon region.

As one studies various texts and articles on the tropics, one discovers a number of terms are used to describe the general climatic features of the region. Many of these terms are used interchangeably while others have become outdated as more is learned about the area. The confusion among terms stems from their number; overly-simple models; introduction of new terms by authors who are rightly trying to distinguish their innovations from others; and, as Cumming (1973) pointed out, from extending mid-latitude concepts into the tropics. Some of the terms found in the literature that tend to lead to confusion are listed below. They have been placed in groups, and an attempt at defining them follows.

<u>Group 1</u>: Meteorological equator
Atmospheric equator
Equatorial trough
Near-equatorial trough
Intertropical trough
Monsoon trough
Doldrums equatorial trough
Doldrums

<u>Group 2</u>: Intertropical convergence zone
Intertropical wind convergence zone
Tropical convergence zone
Convergence zone
Equatorial convergence zone
Near-equatorial convergence zone
Intertropical front
Tropical front
Equatorial front
Cyclonic directional shear zone
Cyclonic shear zone
Tropical confluence
Confluent zones

<u>Group 3</u>: Heat low
Thermal low
Monsoon depression
Monsoon low
Mean circulation centers

<u>Group 4</u>: Equatorial easterlies
Deep trades
Deep easterlies

<u>Group 5</u>: Tropical easterlies
Subtropical easterlies

<u>Group 6</u>: Easterly wave
Equatorial vortex
Equatorial wave

Group 7: Subtropical highs
Subtropical anticyclones
Subtropical ridge line
Near-equatorial buffer zone
Oceanic high
Oceanic anticyclones

Terms in groups 1 and 2, and rarely group 3, are used to define the line of demarkation between the trade winds out of the North (Northeast or Northwest trades) and those out of the South (Southwest or Southeast trades). Generally, this definition is reserved for those terms in group 2. Those in group 1 generally refer to the quasi-continuous belt of low pressure lying between the subtropical highs of the Northern and Southern Hemispheres, and within this region you might detect an area referred to by one of the terms in group 2.

In monsoon meteorology, the terms grouped together in group 3 basically refer to the seasonal low formed over the continent during the warm season and over the adjacent sea during the cold season. In many cases the equatorial trough (group 1) lines up with the monsoon low (group 3).

Those in group 4 are often referred to as the trade winds in the summer hemisphere when they are very deep (8 to 10 km.), while group 5 sometimes refers to the trade winds when they are shallow and exhibit a strong vertical shear. Commonly both groups (4 and 5) are used in the same context referring to the easterly trades.

In group 6 there is a difference in intensity as an equatorial vortex is a closed low within the equatorial trough that develops from an equatorial wave (easterly wave) within the equatorial easterlies.

The last group (7) refers to one of the semi-permanent highs centered near 30°N or 30°S.

No matter what nomenclature is used there is a quasi-continuous belt of low pressure surrounding the globe betweeen the subtropical high pressures. This trough of low pressure near the equator (therefore, named the equatorial or near-equatorial trough) remains relatively constant throughout the year across the Atlantic and the eastern Pacific, but varies markedly by season across the western Pacific and Indian Oceans. The reason for this behavior is related to the subtropical highs which lay off the west coasts of the continents. These highs maintain their character year-round with their positions and intensities varying slightly with the seasons. Where the equatorial trough is tightly wedged between two subtropical highs, there is little migration. However, over Asia during the Northern Hemisphere winter, the main feature is the Siberian high. At that time, the equatorial trough is wedged between the Siberian high and the Mascarene (subtropical South Indian Ocean) high. During the Northern Hemisphere summer, when the Siberian high virtually disappears as a long-term mean feature, the equatorial trough over the Indian Ocean moves far north and aligns itself with the thermal low (monsoon trough) over southwest Asia. Because of the alignment, this equatorial trough is often referred to as the monsoon trough.

In the tropics the locations of the equatorial trough, the wind convergence zone, and maximum cloudiness do not always coincide. Godshall (1968) shows that a displacement exists between the maximum cloud cover areas and the convergence zone centers and that some of these displacements are quite large. The low-level summer monsoon trough, located to the north of our study area, has west winds on the equatorward side. The belt of maximum clouds is often confined to this west-wind area (Sadler, 1970).

One of the most useful tools for a forecaster in the tropics is the gradient-level wind chart. Comparisons of the daily gradient-level chart with the mean charts can give an indication to a forecaster that the weather is likely to change, especially where there are significant departures. A useful publication for this purpose is the Air Weather Service Technical Report 215, Volumes I and II, by Atkinson and Sadler (1970). Atkinson states that when comparing the daily isotach patterns to long-term resultant means, an abnormally large horizontal cyclonic wind shear at the gradient-level may indicate above normal convective activity. Atkinson (1971) also authored Forecaster's Guide to Tropical Meteorology, which presents many useful techniques in tropical analysis and forecasting. He states two prerequisites for accurate forecasts: (1) good analyses; and, (2) diagnoses of the cause of existing weather. The sparsity of reporting stations may limit the achievement of these prerequisites and, therefore, adversely affects the forecaster's skill.

Preparation of surface, gradient, and upper level charts proves to be very valuable in making short-range forecasts. By using all available data sources (surface stations, upper air stations, ships, satellites, radar, pilot reports, and climatology), a forecaster can construct a relatively good analysis of existing conditions. (See Fig. 4 for reporting upper air stations within the study area.) Then by extrapolating the analyzed features, one can make a fairly accurate short-range forecast. Due to the nature of the data, it is easier to extrapolate weather features associated with wind directional changes than wind speed changes. In the tropics the diurnal pressure and temperature changes are generally greater than the interdiurnal changes, making a basic knowledge of these diurnal changes a must in preparing skilled forecasts. Temperatures generally peak around 1:00 p.m. local time and reach a minimum near 6:00 a.m. Pressures peak around 10:00 a.m. and 11:00 p.m. with a minimum around 4:00 a.m. and 4:00 p.m. local time.

Stability indices have not proven to be of much use in forecasting convective activity in the tropics. Therefore, the most useful short-range forecast tool for convective activity is the ship's radar or radar reports from coastal sites.

Other forecasting aids such as radar climatologies, conditional climatologies, and objective forecast studies can be prepared for fixed locations but not very effectively for moving ships.

Hubert (1961), in a case study, showed that a vigorous system which was depicted on a satellite picture could not be delineated by standard meteorological analyses. This continues to be true today, thus underscoring the utility of satellite imagery in tropical analysis. Riehl (1979) states that, since tropical cyclones develop from cloud systems, all potential development for any location within the tropics, can be pinpointed with satellite information -- a notable technological achievement. Conventional data must also be heeded. For example, if a forecaster discovers a wind shift at a station in the tropics, then he needs to scrutinize all possible data in an effort to determine if it is a local effect or a moving wave. Again, the satellite can help a great deal with this type of problem since it will show a well-developed wave.

In a study prepared for the U.S. Army Electronics Command by the National Engineering Science Company (Goldman and Freeman, 1965), it was theorized that there is an internal wave in the easterlies at the interface of the tropical inversion which traps the lower moist layer and the upper layer of drier air. Disturbances in this internal wave can create convective activity. Standard analyses in the tropics did not generally recognize these internal waves until they became associated with showers. One of the problems was the lack of soundings. The advent of satellite soundings improved tropical analysis considerably, although further development is necessary to utilize these four-dimensional concepts. Surface data along with the potential temperature and winds along the boundary layer of the inversion must be analyzed a number of times a day in order to locate and track the internal waves.

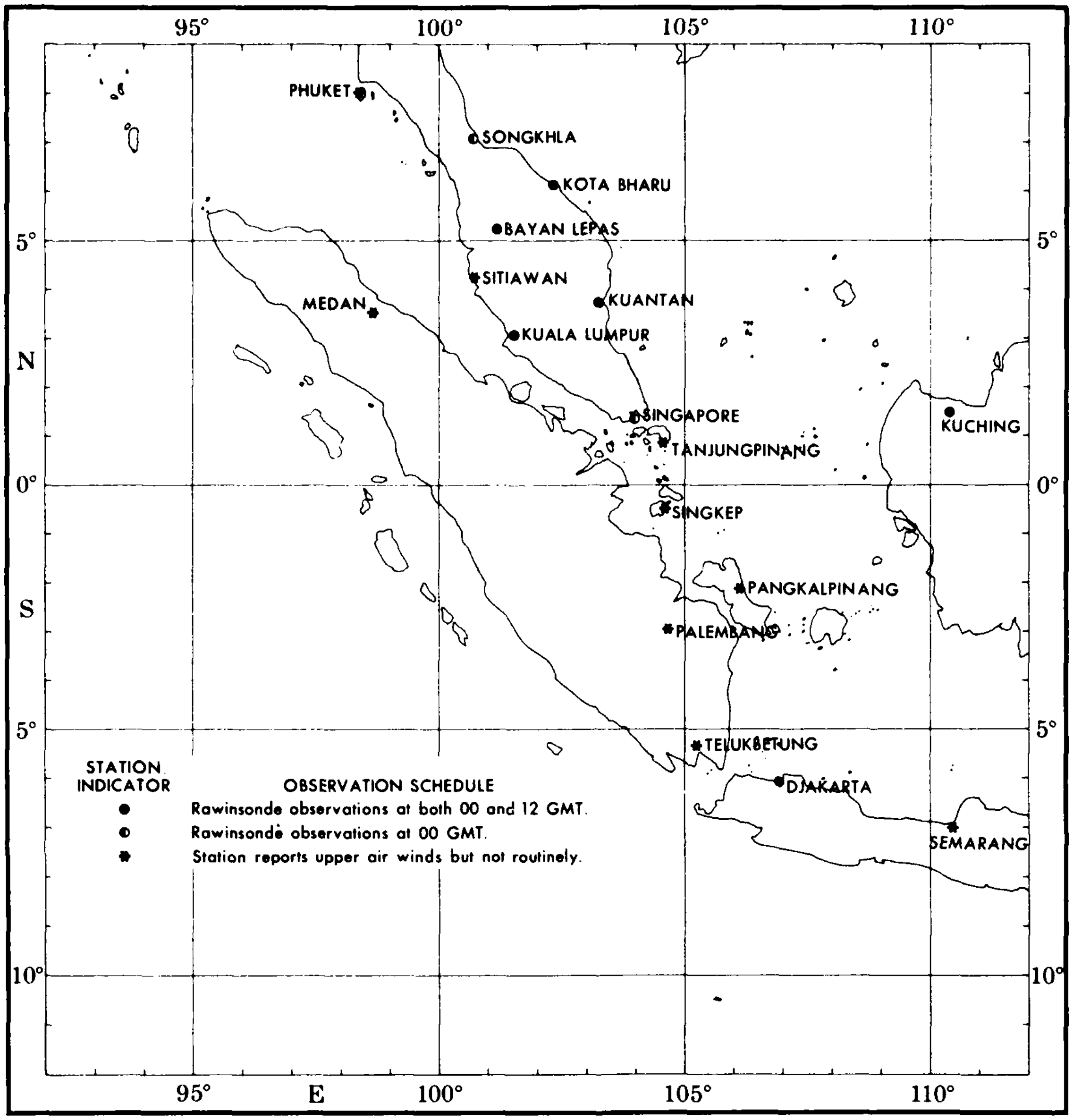


Fig. 4 UPPER AIR REPORTING STATIONS AS OF NOVEMBER 1981

Squalls and thunderstorms are the most significant weather features within the study area. Some of these may be spawned by the rare tropical cyclones that skirt the northern and southern periphery, but they are not generally a problem. Strong lines of thunderstorms that develop across the Malacca Strait are known as "Sumatras." During the southwest monsoon (April through November) the Sumatras, usually occurring at night, generally move from the southwest; although, sometimes out of the west or northwest. Sumatras are produced by the southwest monsoon winds being reinforced by strong mountain winds that are generated by nighttime radiation from the higher grounds followed by the descent of this cooler, more dense air. The warm seas, cool mountain air, and the orographic lift by the numerous mountain ranges produce the heavy thunderstorms and abundant rainfall. These Sumatras move out over the Malacca Strait and, in many instances, onto the west coast of the Malay Peninsula. Although the annual rainfall for the region is one of the heaviest on earth, it is due more to convective downpours rather than extended periods of precipitation (Kendrew, 1942). In fact, they have considerable periods of sunshine.

A maximum number of thunderstorm days occurs on the west coast of the Malay Peninsula during April, the transition into the southwest monsoon. The frequency of thunderstorm days along this area is higher during the southwest monsoon than the northeast monsoon with a minimum number of thunderstorm days occurring during February. Even though the number of thunderstorm days has a seasonal pattern, the monthly precipitation amounts remain relatively uniform. During the northeast monsoon (December-March), there are few thunderstorm days along the east coast of Malay, but a significant number on the west coast. Nieuwolt (1966) points out that an inverse correlation exists over the east coast of Malay between the strength of the monsoon and the amount of precipitation received, so usually the stronger the winds the less the precipitation. This appears in many regions of the study area where the highest mean monthly precipitation values occur during the transition month of November, as the northeast and southwest monsoons coalesce.

EQUATORIAL WEATHER FEATURES WITHIN THE STUDY AREA

Precipitation

Of all the elements recorded in the marine data base, precipitation is one of those most subject to error in both the way it is observed and interpreted. Many observers have a bias for certain present weather codes and there may be a fair weather bias introduced especially in the more recent years as ships try to avoid extremely bad weather (which is seldom encountered in the study area). A fair weather bias may also be enhanced if the weather observer fails to take an observation because of other priorities during foul weather (heavy ship traffic, entering a port, etc.).

Orographic effects may cause precipitation patterns and the frequency of thunderstorms to vary greatly from the ocean environment to nearby land areas. Subtle changes of five to ten percent in the monthly mean precipitation over the water can be detected on the isopleth charts. During the northeast monsoon (as compared to the southwest monsoon) the percent of observations reporting precipitation is five percent less to the northeast of the Malay Peninsula and five percent greater to the southwest of Sumatra and Java. The terms northeast and southwest monsoon are very descriptive of the climate over the South China Sea but not quite so descriptive of conditions in the study area south of the equator, especially south of Java. The characteristic wind flow also depends on the location of the equatorial trough.

The northeast monsoon starts its southerly movement during October over southeast Asia and does not reach the southern end of the Malay Peninsula until mid-December. Over much of the study area during November and December, equatorial westerly winds, remnants of the southwest monsoon, converge with the southerly limit of the northeast monsoon in the equatorial trough resulting in widespread heavy rainfall along the air-mass boundary (World Survey of Climatology, Volume 9). Rainfall is also enhanced by the mountain ranges which provide orographic lift. As a result, November and December are the wettest months along the northeastern coast of the Malay Peninsula, averaging over 20 inches at Kota Bharu and Kula Trengganu. February and April have the minimum precipitation over the northeast Malay Peninsula. Even though the wind force during February is similar to that of January, the average amount of precipitation during February is approximately half that of January. This decrease may be due to a weak thermal low forming over mainland Asia and deflecting the main air current over the South China Sea. This causes divergence, subsidence; and, thus, prevents formation of disturbances (World Survey of Climatology, Volume 9).

With the many mountain ranges, valleys, and coastal areas within the study area, the precipitation pattern tends to be quite complex. The northeast monsoon brings the heaviest rains to the east coast of the Malay Peninsula, and the southwest monsoon the heavier rains to the west coast of Sumatra. In both monsoon seasons the areas on either side of the Malacca Strait find themselves within the rain-shadow (opposite side of the mountain range from the rain-producing winds). This is clearly illustrated by the mean annual rainfall amounts (Fig. 3). The transition months of March to April and October to November bring the greatest amounts of precipitation to the southwest coast of the Malay Peninsula while Singapore on the southern end has its maximum during December.

On the west coast of Sumatra, Padang has its greatest rainfall during November and its least during July. Java has a minimum during the southwest monsoon, and maximum during the northeast monsoon regardless of the prevailing winds or whether one is on the windward or lee side of the mountains. Djakarta, on the northwest end of Java, has its maximum precipitation in January and minimum during July and August; while Cilacap on the south-central portion of the island has its maximum during November and minimum during July.

Looking at the marine area maps, even though the percentage of present weather observations reporting precipitation (an estimate of the probability of precipitation) does not change drastically, one can see a slight decrease in the frequency of precipitation during the southwest monsoon while the equatorial trough has moved far north over southern Asia.

Thunderstorms

Buitenzorg, in the hills nearby Djakarta, reports over 300 thunderstorm days per year (Fig. 5), the highest recorded frequency on earth (Riehl, 1954). Yet, the frequency of marine observations reporting thunder only reaches five to ten percent as a maximum in the marine areas where uniformity is the main theme reflected by the thunderstorm isopleth charts. For the study area a moderate peak in thunderstorm frequency is reported during the November to April period for the Sunda Strait and regions near Java. The April to November period brings the highest frequencies over the Malacca Strait and somewhat of a decrease over the Sunda Strait and Java regions.

Tropical Cyclones

At maturity a tropical cyclone is one of the most feared and hazardous creations of nature and could prove to be disasterous for those ships entering or exiting the study area. In order for convective activity to organize into a vortex, it must be influenced by the coriolis parameter which is too small to be effective within approximately five degrees of the equator. However, the early stages of development of tropical cyclones have been observed within two degrees of the equator in the western Pacific and northeastern Indian Ocean. Thus, the limiting factors of the coriolis parameter may have been overrated (Riehl, 1979). Tropical cyclones do frequently form within eight to ten degrees of the equator; however, it is rare for an intense cyclone to be found within ten degrees of the equator.

Traffic in the Northern Hemisphere has the greatest chance of encountering a tropical cyclone in the North Pacific from May through December, with the greatest probabilities of storms occurring from July through September. In the North Indian Ocean chances are greatest from October through December with a second maximum occurring from April through June. In the Southern Hemisphere the main season runs from November through April.

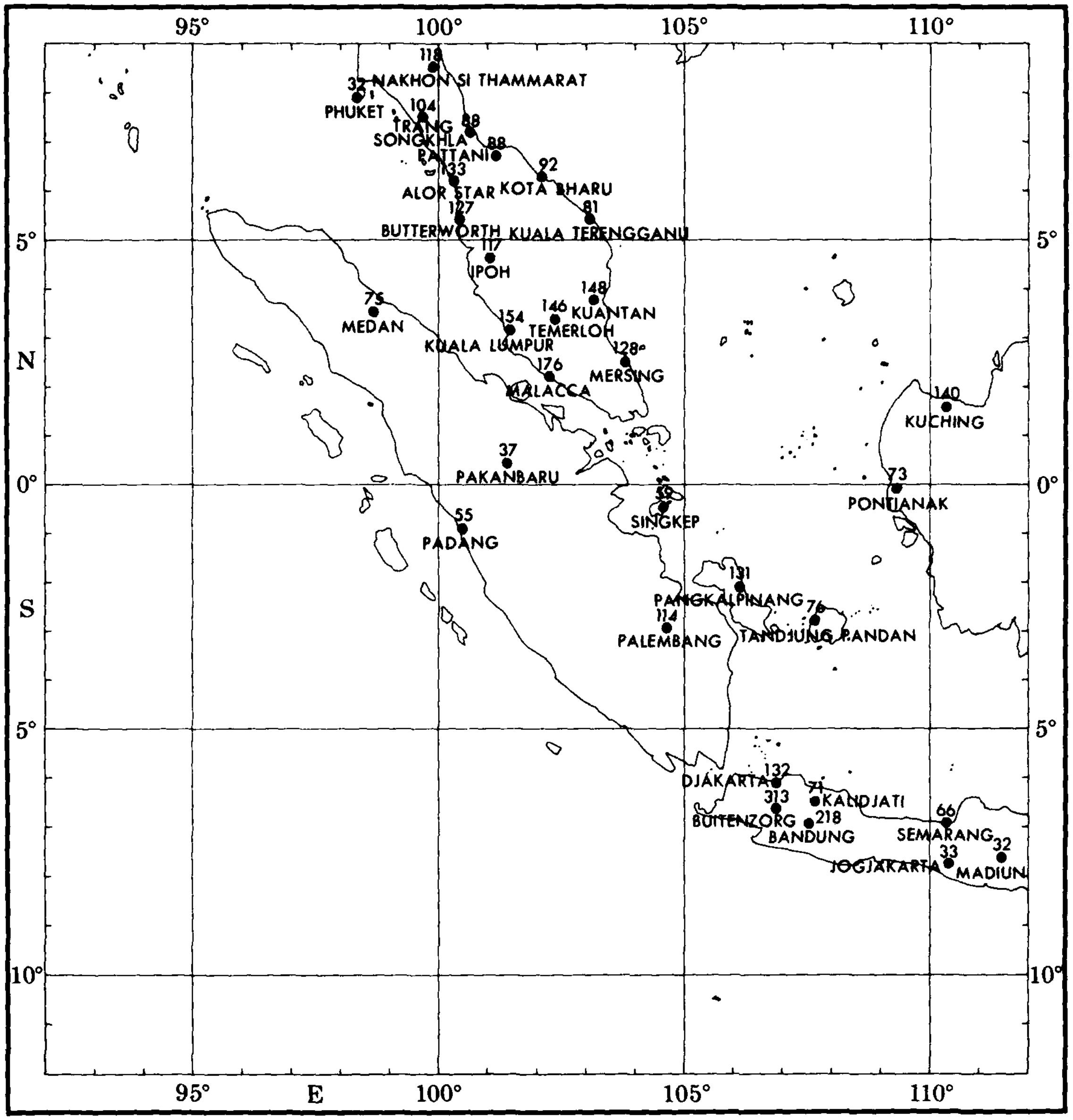


Fig. 5 MEAN ANNUAL NUMBER OF DAYS WITH THUNDERSTORMS

Air Temperature

Air temperatures are one of the most frequently observed elements by mariners. Due to instrument exposure on many ships, the heating effects of the ship's structure has a tendency to produce higher than actual ambient air temperature readings. This is especially true in the tropics where sunny, calm days are numerous. Minimum seasonal variability is noted in the study area as mean monthly temperatures range from only 78°F to 84°F. In fact, the diurnal variation is greater than the mean monthly seasonal variation (Fig. 2).

Sea Surface Temperature

Sea surface temperatures are also recorded with a fairly high frequency in marine observations. Two principal methods for sampling are used, intake thermometers and bucket temperatures. Even though the two systems produce slightly different results, the data can still be used with considerable confidence. The sea surface temperature gradient also reflects the two distinct monsoon seasons. During the northeast monsoon, the sea surface temperature gradient is relatively tight to the east of the Malay Peninsula and weak to the south of Java. The reverse is true during the southwest monsoon. Monthly mean temperatures range from just over 77°F to just under 86°F.

Surface Winds

Surface winds are one of the most commonly observed elements. Many of the observations from the NCC data base are visual observations based on the roughness of the sea. In more recent years more and more ships are acquiring anemometers and reporting measured winds. Prior to 1963 many of the wind speeds were recorded in the Beaufort scale; however, such estimates have proven to be quite reliable and can be used with a high degree of confidence. Five sets of wind speed isopleth charts were produced for this study, but only three are presented: mean winds, percent frequencies of wind less than or equal to 10 knots; and percent frequency of winds between 11 and 21 knots. The other two categories, percent frequency of wind speeds between 22 and 33 knots and greater than or equal to 34 knots, had percent frequencies of less than five percent. For more detail, one should reference the wind speed distribution graphs presented for the four representative areas. As with the sea surface temperatures, the wind speeds as well as the directions reflect the monsoon seasons. During the northeast monsoon, the mean wind speeds and frequency of higher winds are greatest to the east of the Malay Peninsula and less to the south of Java. This process reverses during the southwest monsoon. The remaining areas, especially northwest of Sumatra, do not show quite as strong a transition.

Visibility

Visibilities are difficult to measure at sea because of the lack of reference points. Climatically, many low visibility observations are probably missed because the mate is too busy (fair weather bias). However, the coarseness of the coding intervals tends to minimize the problem permitting the summarized data to be relatively consistent. The visibility-tables that are presented by one-degree square show the entire region to have a high frequency (90% plus) of visibilities of five miles or better.

Ceiling and Visibility

Aircraft-type ceilings are not available from marine observations. The ceilings are estimated as the height of the lowest cloud when low clouds cover more than half the sky. When the sky is totally obscured by rain, fog, smoke or other phenomena, the total obscuration is considered a ceiling with a height of zero. The infrequent occurrence of ceilings less than 600 feet and/or visibility less than two nautical miles lead us to drop this presentation and the lower category of less than 300 feet and/or visibility less than one nautical mile. However, higher categories of ceiling and visibility are presented.

Wave Heights

Wave heights have been recorded in a consistent quantitative code only since the late 1940's. The reluctance of many observers to take wave observations in the earlier years and the difficulty in estimating waves, especially in confused seas, makes wave observations one of the least commonly observed elements. They are also subject to biases. Generally the heights are too low, the periods too short, and the sea-swell discrimination poor (Quayle, 1980). The data in this study have not been adjusted for these suspected biases other than being processed through a quality control procedure where an internal check was made between wind speed and sea height. The data were also arrayed and apparently erroneous outliers deleted in both the sea and swell data. As with both temperature and winds, the effects of monsoon seasons can be detected from the wave height charts. These effects can be spotted on the wave charts greater than or equal to three feet, but even more obviously on the percent frequencies of waves greater than or equal to eight feet. Over the South China Sea, waves are highest during the northeast monsoon. Over the Indian Ocean south of Java and Sumatra, waves are highest during the southwest monsoon.

Ocean Currents

The ocean current charts are compiled principally from ship drift reports that were forwarded by the various merchant marines to the Naval Oceanographic Office. From these drift observations the set (direction) and drift (speed) of the prevailing currents are calculated for each one-degree square. The density of observations is greatest along the major shipping routes and reliability of the current charts is best in these areas. The data are considered most useful when used collectively as in summaries where a large number of observations are available.

The surface current charts displayed for the Malacca Strait are winter (November through April), summer (May through October), and annual (January through December). For the Sunda Strait the displayed charts are summer (January through March), autumn (April through June), winter (July through September), spring (October through December), and annual (January through December).

Summary

To date, no reliable numerical weather prediction models have been developed for the tropics. Until progress is made in this field, climatology will continue to be one of the most valuable forecast tools. As stated in the introduction, conditions vary little from the mean in the tropics making climatology a good representative of expected conditions. The goal of this climatic study is to provide the synoptic meteorologist with the necessary climatology with which to improve his forecasts.

References

Atkinson, G. D. and J. C. Sadler: Mean-Cloudiness and Gradient-Level Wind Charts Over the Tropics, Volume I Text, Volume II charts. Air Weather Service Technical Report 215, 1970.

Atkinson, G. D.: Forecaster's Guide to Tropical Meteorology, Air Weather Service (MAC) USAF, Technical Report 240, 1971.

Crutcher, H. L. and R. G. Quayle: Mariners Worldwide Climatic Guide to Tropical Storms at Sea, NAVAIR 50-1C-61, Naval Weather Service Command, Washington. Government Printing Office, 1974.

Cumming, M. J.: Handbook for Forecasters in the Bay of Bengal. NAVENVPREDRSCHFAC Technical Report EPRF TP 7-73, 1973.

Department of the Navy: Naval Oceanographic Office Special Publication 1404-IN2, Surface Current Northeast Indian Ocean Including the Bay of Bengal, Andaman Sea and South China Sea, October 1977.

Department of the Navy: Naval Oceanographic Office Special Publication 1404-IN4, Surface Currents Central Indian Ocean, September 1977.

Department of the Navy: Weather in the Indian Ocean to Latitude 30°S and Longitude 95°E Including the Red Sea and Persian Gulf, Volume 1: General Information. NAVENVPREDRSCHFAC Technical Bulletin TB 80-02, Reprint 1980.

Godshall, F. A.: Intertropical Convergence Zone and Mean Cloud Amount in the Tropical Pacific Ocean. Monthly Weather Review, Vol. 96, No. 3, 1968.

Goldman, J. L. and J. C. Freeman, Jr.: The Effects of Internal Waves in the Easterlies on Mesoscale Weather Developments. U.S. Army Electronics Command, July 1965.

Hubert, L. F.: A Subtropical Convergence Line of the South Pacific, A Case Study Using Meteorological Satellite Data. Journal of Geophysical Research, Volume 66, No. 3, March 1961.

Huschke, Ralph E.: Glossary of Meteorology. American Meteorological Society, Boston, Massachusetts, 1959.

Kendrew, W. G.: The Climate of the Continents. Oxford University Press, New York, 1942.

Klein, W. H.: Principal Tracks and Mean Frequencies of Cyclones and Anticyclones in the Northern Hemisphere. Research Paper No. 40, U.S. Weather Bureau, Washington, 1957.

Krishnamurti, T. N. and H. N. Bhalme: Oscillations of a Monsoon System Part 1 Observational Aspects. Florida State University, 1976.

Landsberg, H. E.: Climates of Northern and Eastern Asia. World Survey of Climatology, Volume 8, 1969.

Landsberg, H. E.: Climates of Southern and Western Asia. World Survey of Climatology, Volume 9, 1981.

Nieuwolt, S.: A Comparison of Rainfall in the Exceptionally Dry Year 1963 and Average Conditions in Malaya. Erdkunde, 20, pp. 169-181, 1966.

Padya, B. M.: Cyclones of the Mauritius Region. Meteorological Office Mauritius, 1976.

Quayle, R.G.: Climatic Comparisons of Estimated and Measured Winds from Ships. Journal of Applied Meteorology, Vol. 19, No. 2, 1980.

Ramage, C.S.: Monsoon Meteorology, International Geophysics Series, Volume 15. University of Hawaii, Academic Press, 1971.

Riehl, H.: Tropical Meteorology. University of Chicago, 1954.

Riehl, H.: Climate and Weather in the Tropics. Academic Press, Inc. (London) Ltd., England, 1979.

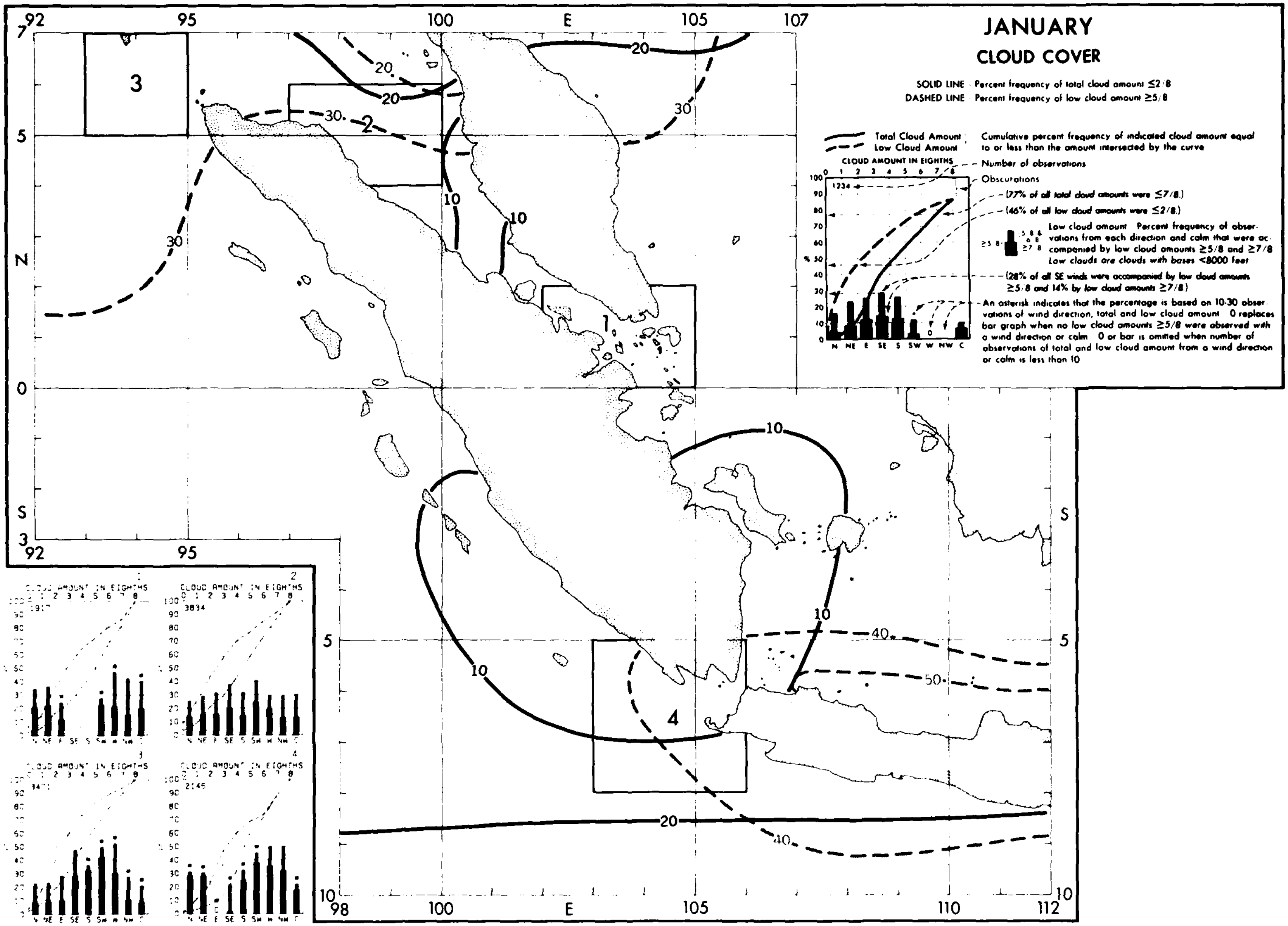
U.S. Department of Commerce and United States Air Force: Global Atlas of Relative Cloud Cover 1967-70. Washington, 1971.

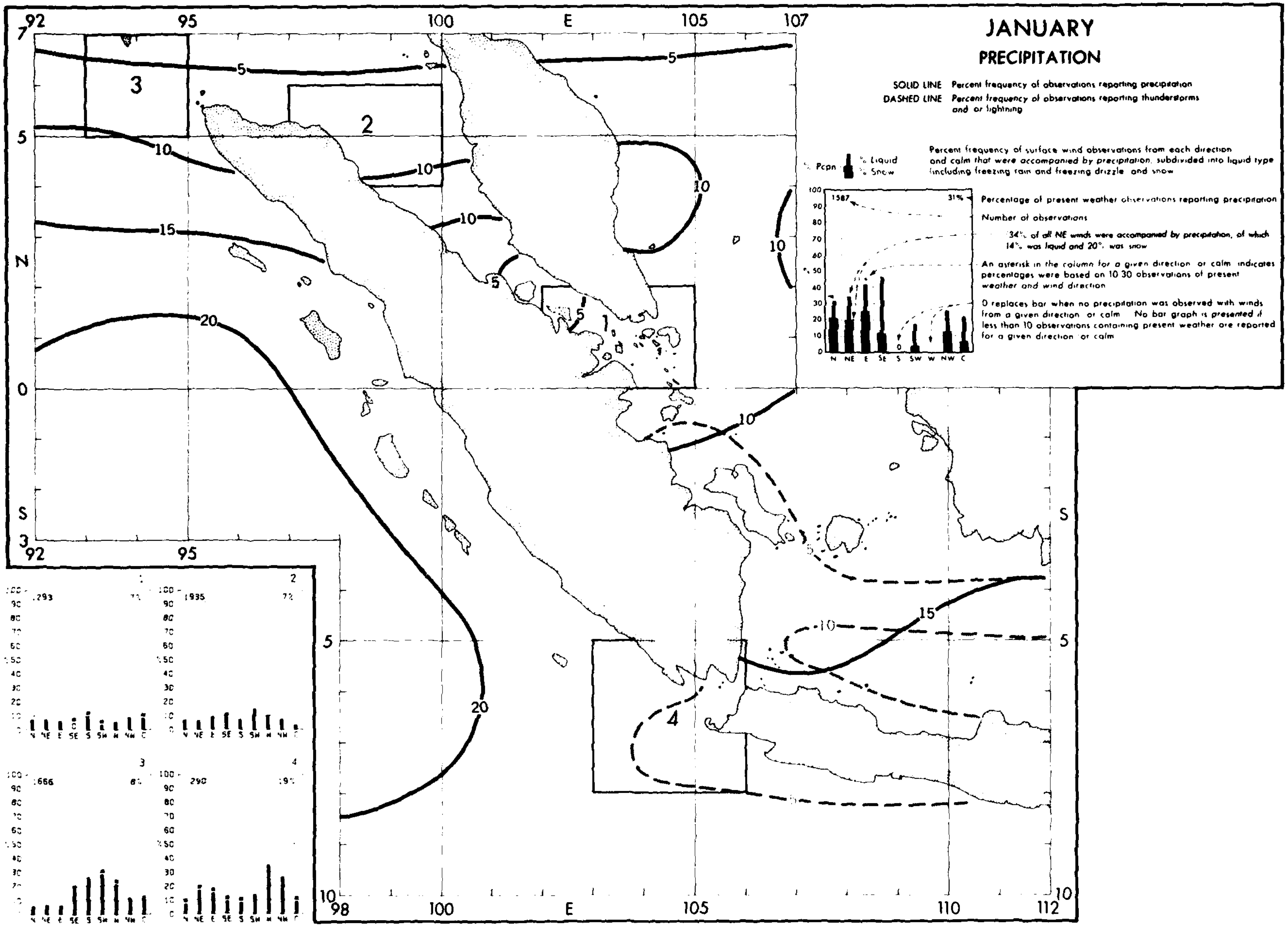
U.S. Navy, Naval Weather Service Command: Marine Climatic Atlas of the World, Volume III (Revised), Indian Ocean. March 1976.

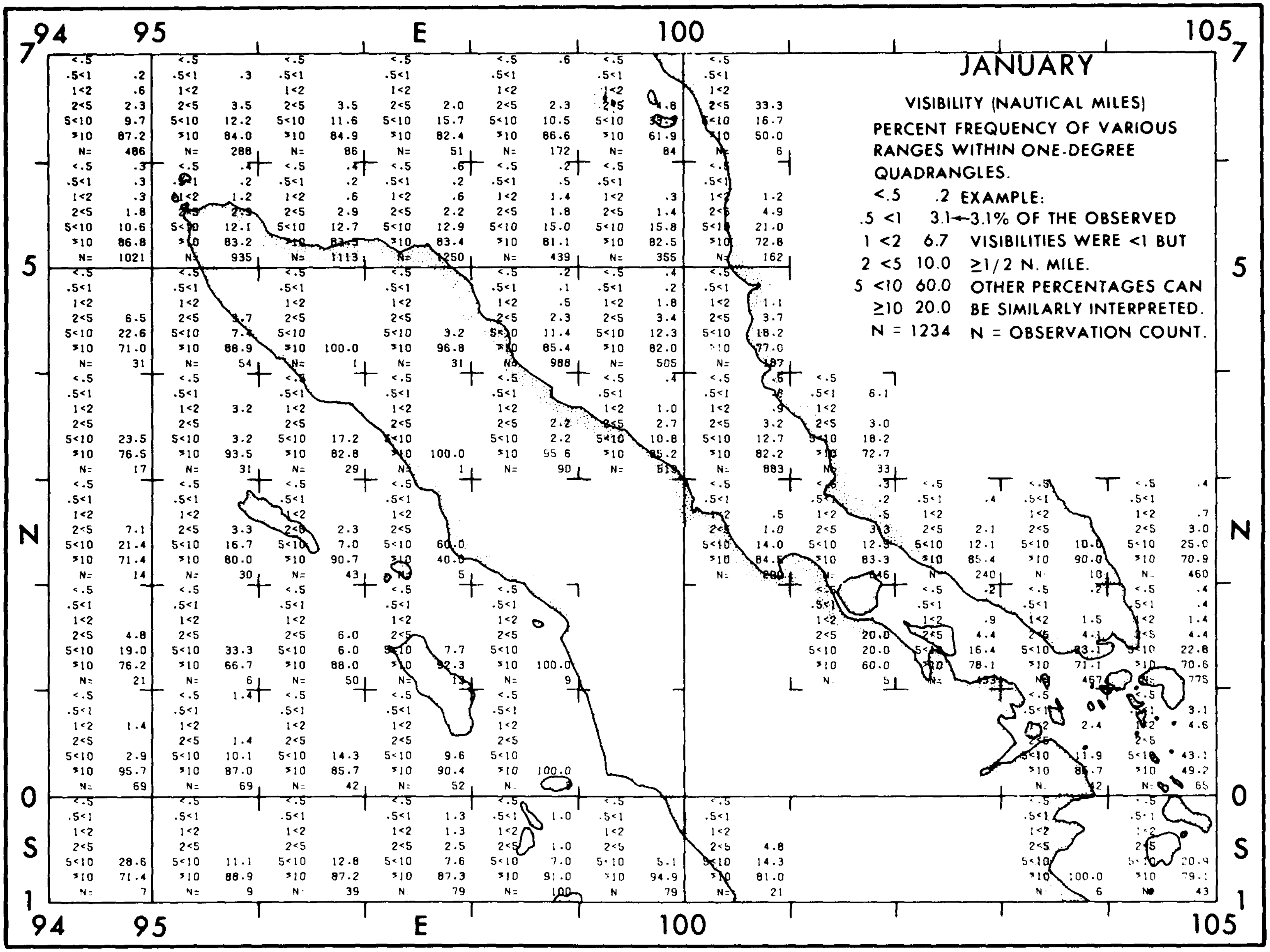
Yao, A.Y.M., G.L. Barger and H.L. Crutcher: Precipitation Probability for Eastern Asia, NOAA Atlas 1. Silver Spring, Maryland, July 1971.

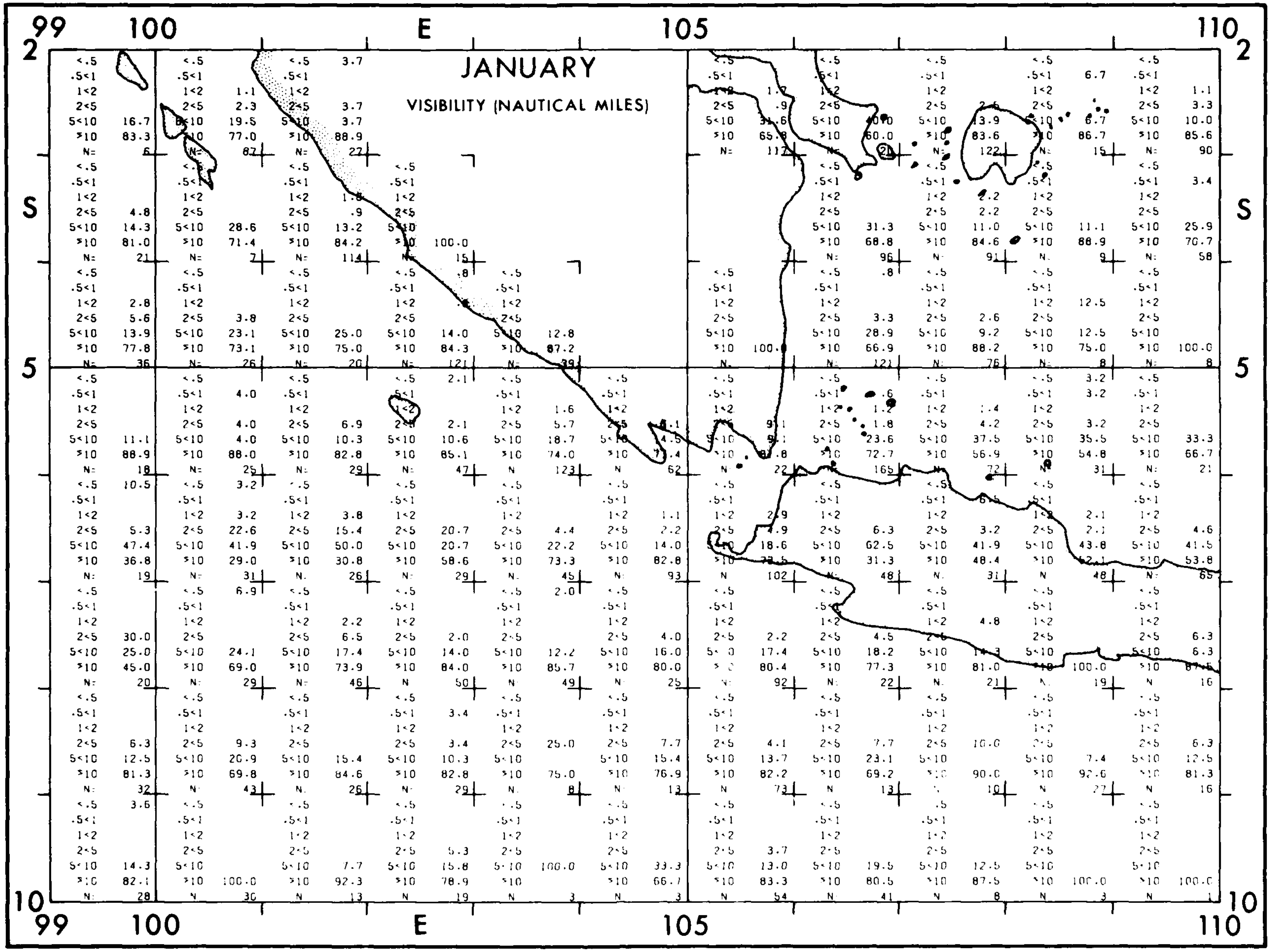
INDEX

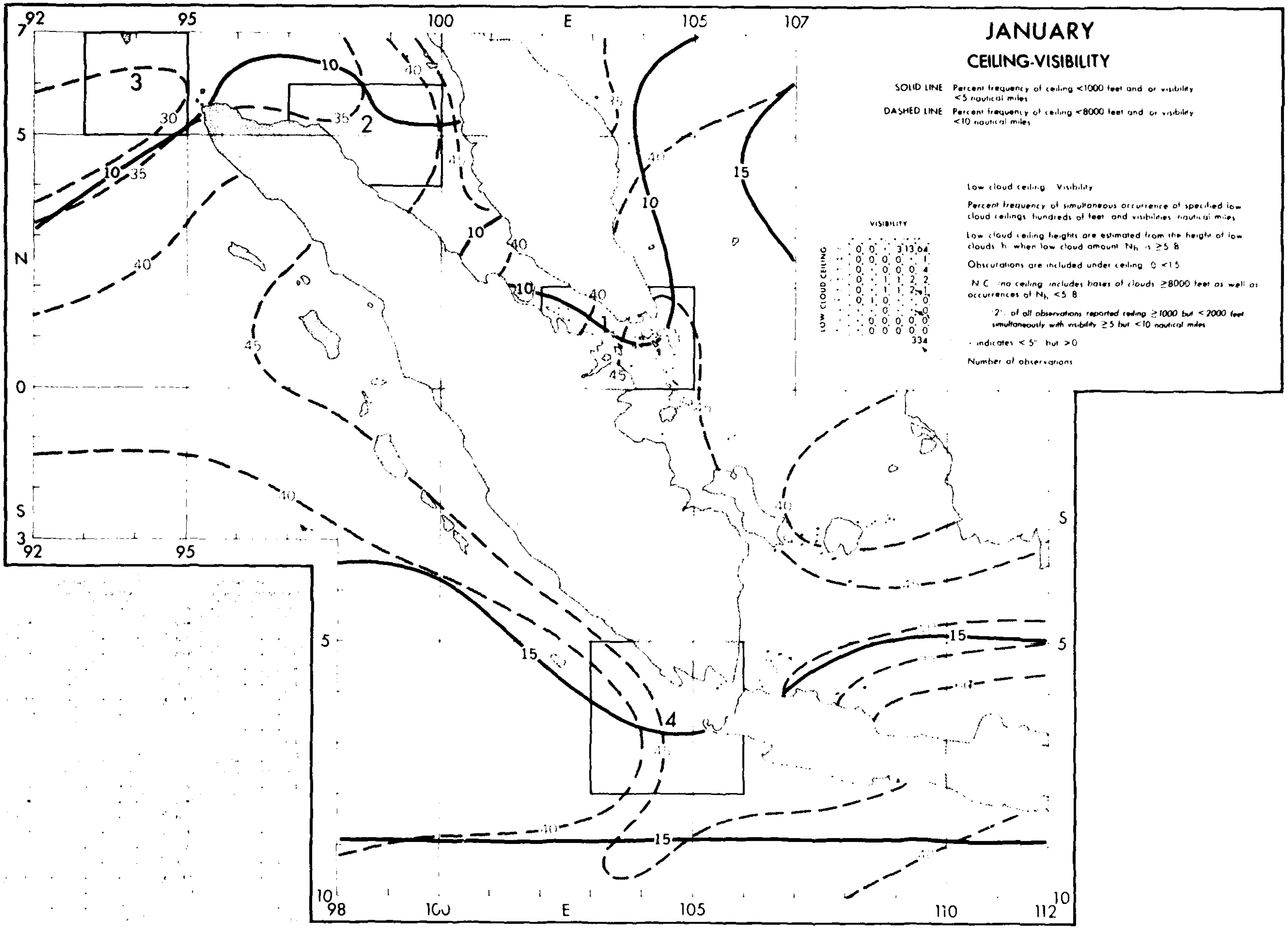
MONTH \ ELEMENT	CLOUDS	PRECIPITATION	VISIBILITY-TABLES	CEILING-VISIBILITY	WIND-VISIBILITY-CLOUDINESS	SCALAR MEAN WIND SPEED	WIND SPEED <11 and 11-21 knots	SURFACE WIND ROSES	AIR AND SEA TEMPERATURE	WAVES	WAVE HEIGHT-TABLES	SURFACE CURRENTS (seasonal)
JANUARY	2	3	4	6	7	8	9	10	12	13	14	170 THRU 178
FEBRUARY	16	17	18	20	21	22	23	24	26	27	28	
MARCH	30	31	32	34	35	36	37	38	40	41	42	
APRIL	44	45	46	48	49	50	51	52	54	55	56	
MAY	58	59	60	62	63	64	65	66	68	69	70	
JUNE	72	73	74	76	77	78	79	80	82	83	84	
JULY	86	87	88	90	91	92	93	94	96	97	98	
AUGUST	100	101	102	104	105	106	107	108	110	111	112	
SEPTEMBER	114	115	116	118	119	120	121	122	124	125	126	
OCTOBER	128	129	130	132	133	134	135	136	138	139	140	
NOVEMBER	142	143	144	146	147	148	149	150	152	153	154	
DECEMBER	156	157	158	160	161	162	163	164	166	167	168	

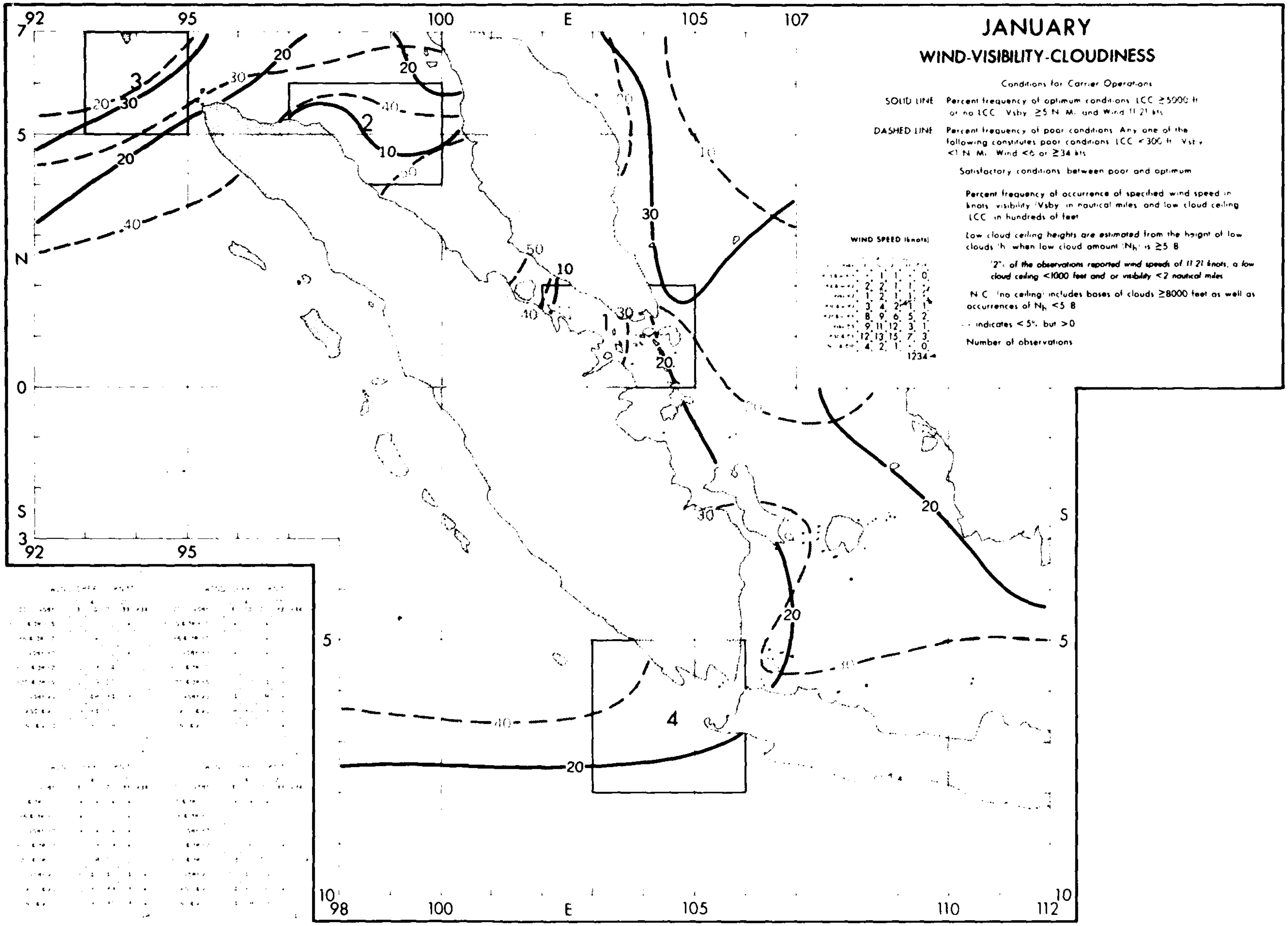

JANUARY
CLOUD COVER
SOLID LINE · Percent frequency of total cloud amount ≤2/8
DASHED LINE · Percent frequency of low cloud amount ≥5/8
Total Cloud Amount
Low Cloud Amount
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
CLOUD AMOUNT IN EIGHTHS
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8.)
(46% of all low cloud amounts were ≤2/8.)
Low cloud amount. Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8.)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
1
2
3
4
CLOUD AMOUNT IN EIGHTHS
1917
3834
3471
2145
N NE E SE S SW W NW C

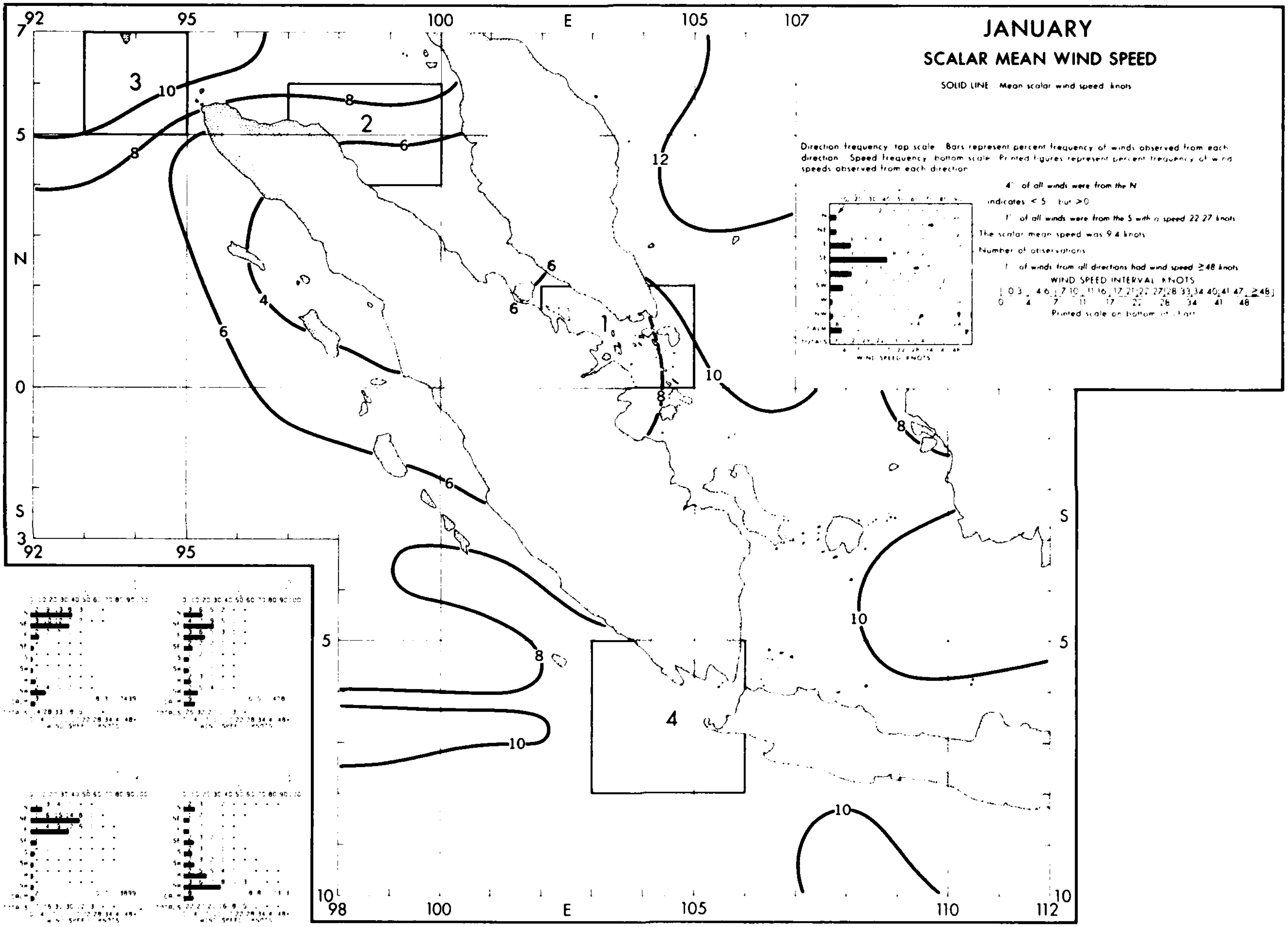

JANUARY
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation, subdivided into liquid type (including freezing rain and freezing drizzle) and snow
% Pcpn
% Liquid
% Snow
Percentage of present weather observations reporting precipitation
Number of observations
34% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10-30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
1587
31%
N NE E SE S SW W NW C
1
2
3
4
1293
1935
1666
290

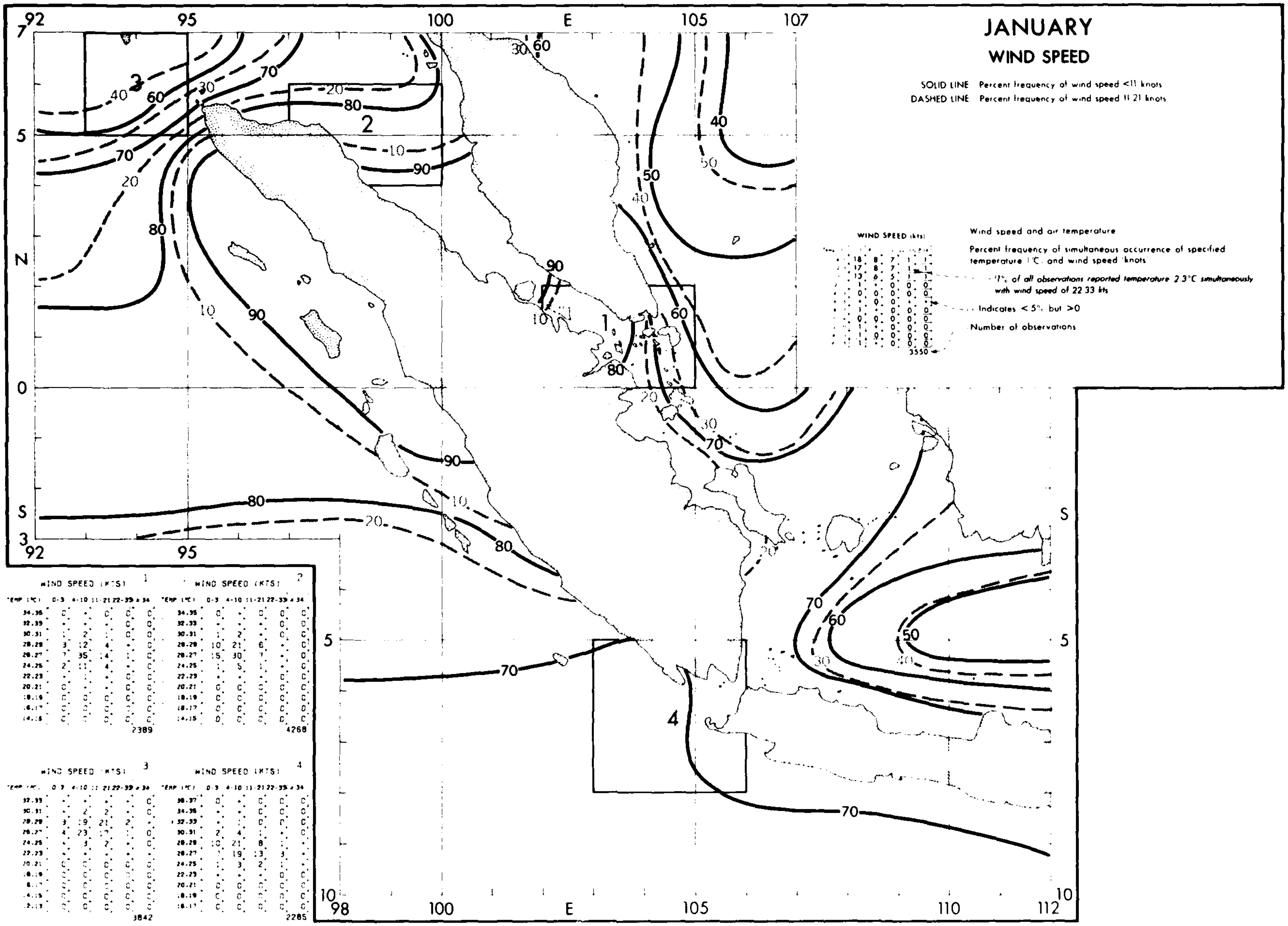

JANUARY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1

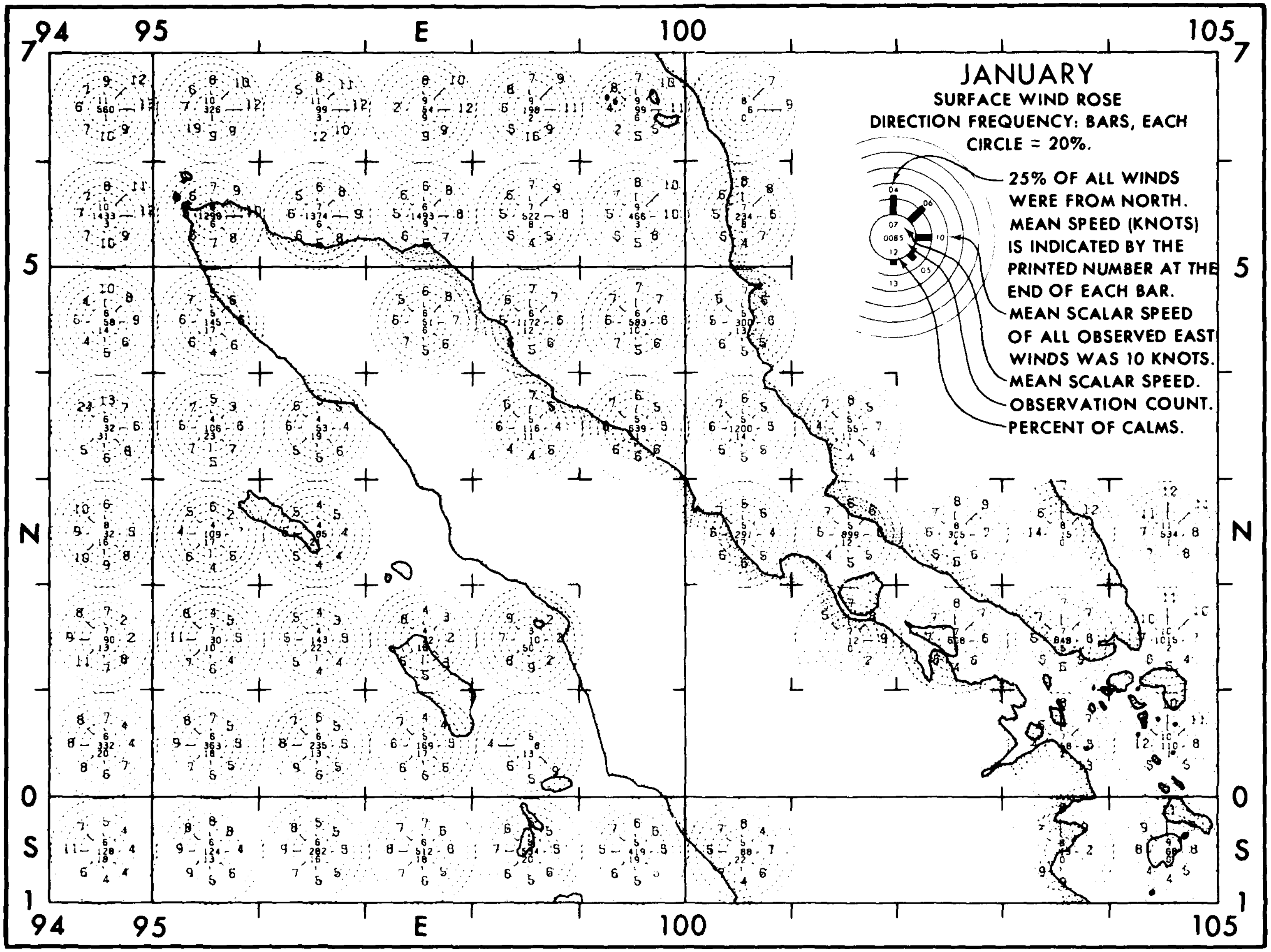

JANUARY
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10

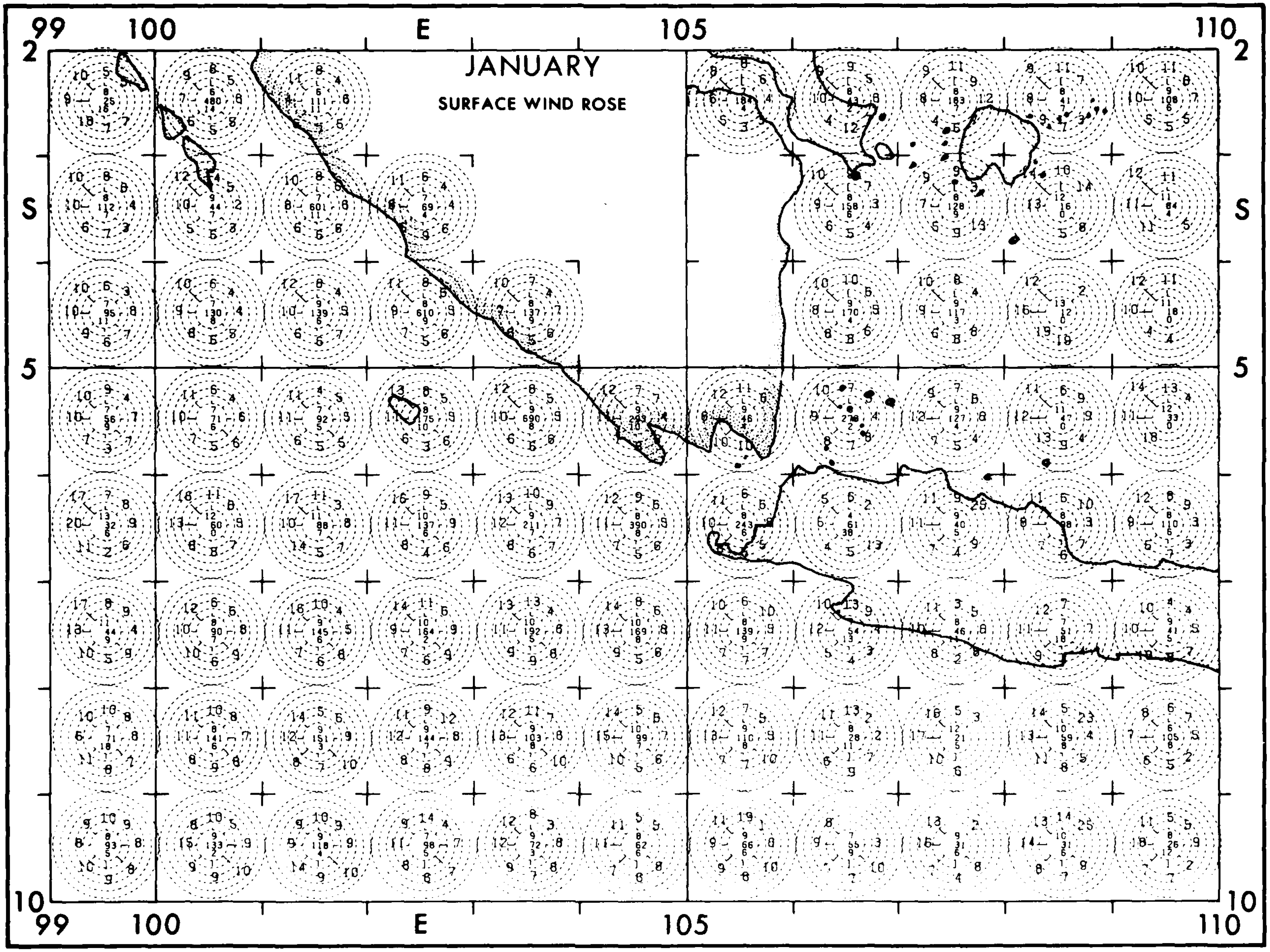

JANUARY
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings hundreds of feet and visibilities nautical miles
Low cloud ceiling heights are estimated from the height of low clouds h when low cloud amount Nh is ≥5 8
Obscurations are included under ceiling 0 <1 5
N C no ceiling includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
2 of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles
· indicates <5 but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
92
95
100
E
105
107
98
110
112
N
S
0
5
10
3
7

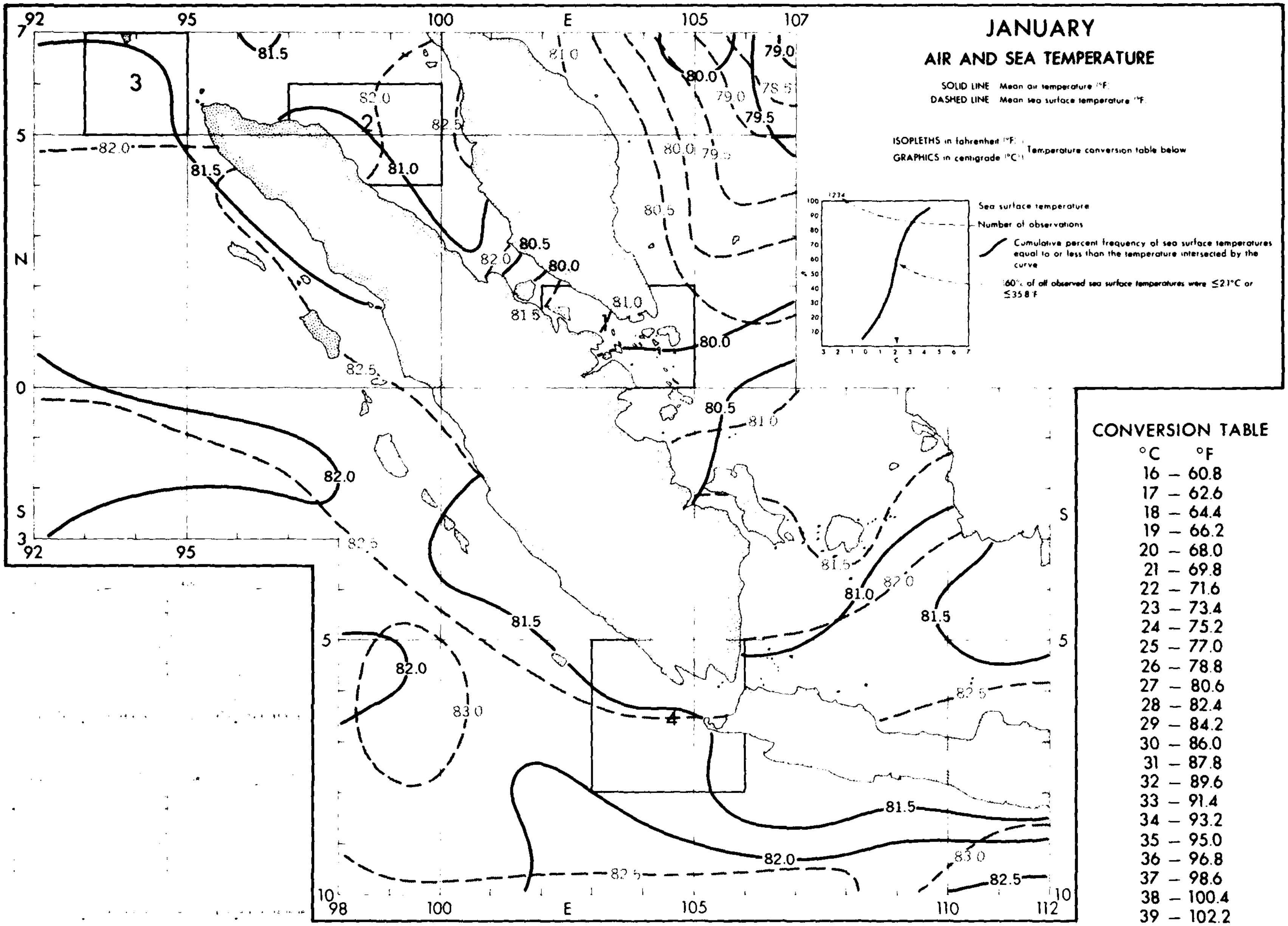

JANUARY
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft or no LCC Vsby ≥5 N. Mi. and Wind 11-21 kts
DASHED LINE Percent frequency of poor conditions. Any one of the following constitutes poor conditions LCC <300 ft Vsby <1 N. Mi. Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
WIND SPEED (knots)
Percent frequency of occurrence of specified wind speed in knots visibility (Vsby) in nautical miles and low cloud ceiling LCC in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5/8
'2'% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and or visibility <2 nautical miles
N.C. (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5/8
· indicates <5% but >0
Number of observations
1234
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10
1
2
3
4
10
20
30
40
50


JANUARY
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed knots
Direction frequency top scale. Bars represent percent frequency of winds observed from each direction. Speed frequency bottom scale. Printed figures represent percent frequency of wind speeds observed from each direction.
4% of all winds were from the N
indicates < 5 but > 0
1% of all winds were from the S with a speed 22-27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥48 knots
WIND SPEED INTERVAL KNOTS
WIND SPEED KNOTS
92
95
100
105
107
110
112
98
E
N
S
7
5
0
3
10
1
2
3
4


JANUARY
WIND SPEED
SOLID LINE Percent frequency of wind speed <11 knots
DASHED LINE Percent frequency of wind speed 11 21 knots
Wind speed and air temperature
Percent frequency of simultaneous occurrence of specified temperature (°C) and wind speed (knots)
1% of all observations reported temperature 23°C simultaneously with wind speed of 22 33 kts
Indicates < 5% but >0
Number of observations

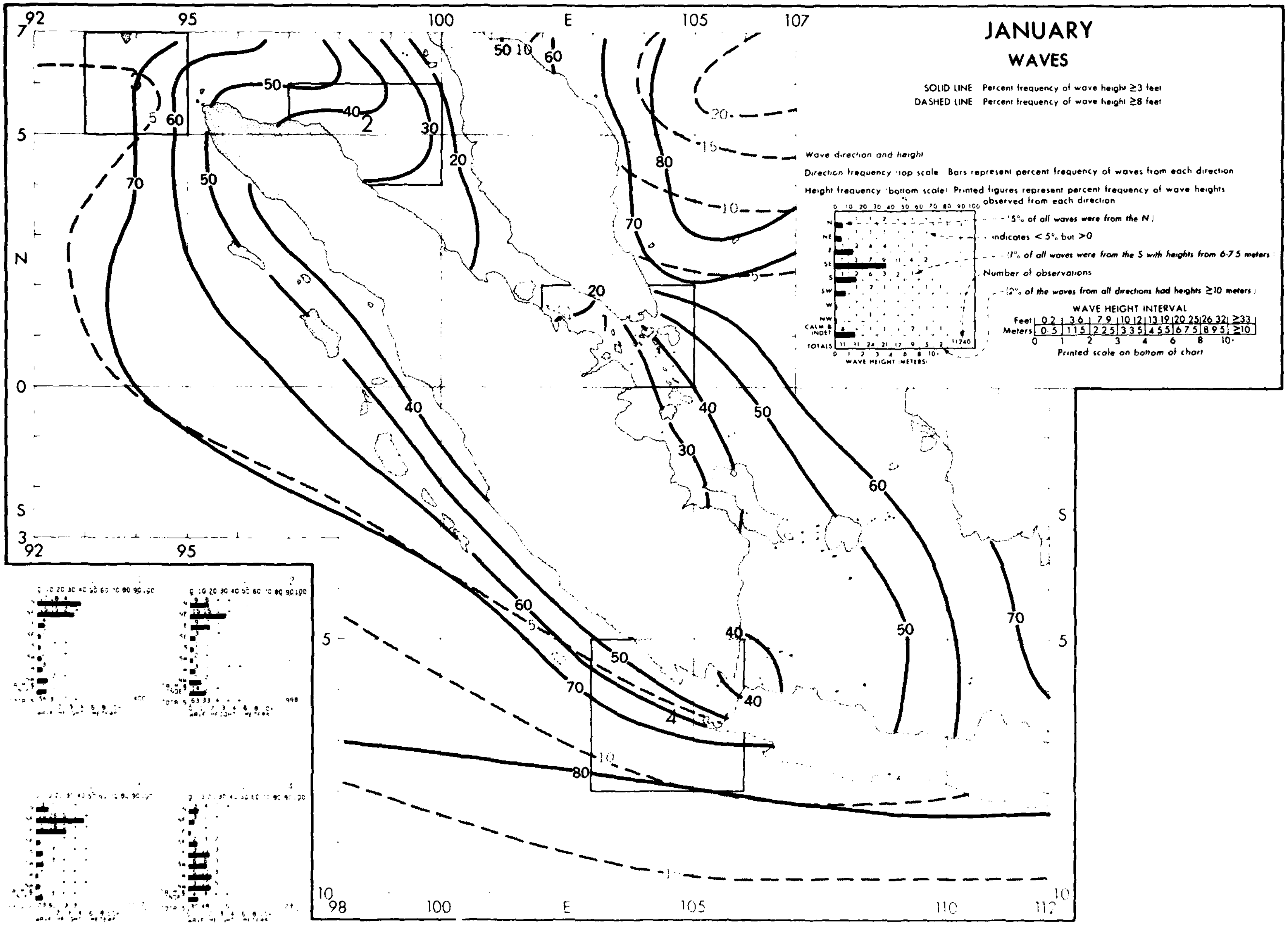

JANUARY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
E
100
105
7
5
N
0
S
1

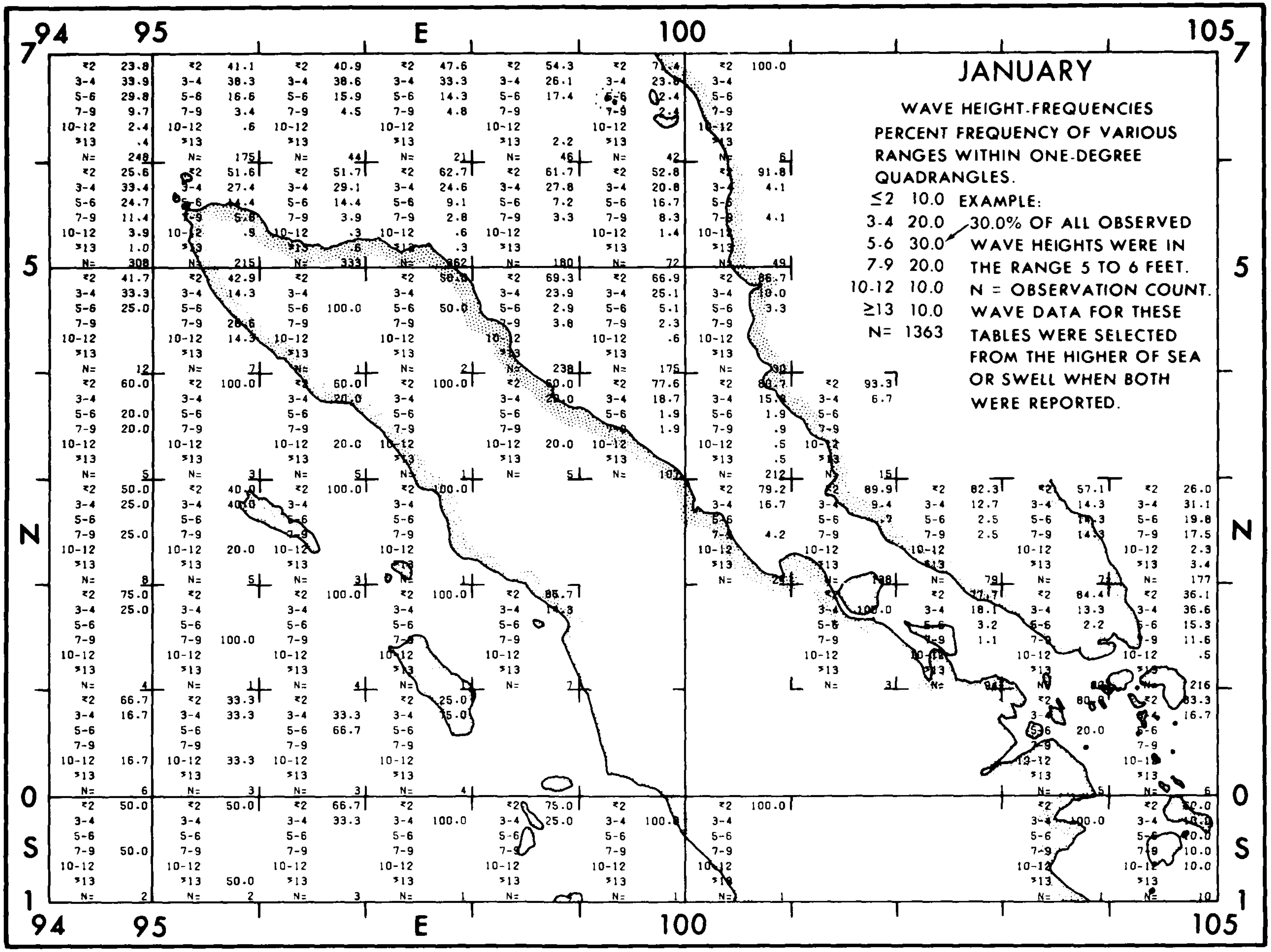

JANUARY
SURFACE WIND ROSE
99
100
E
105
110
2
S
5
10

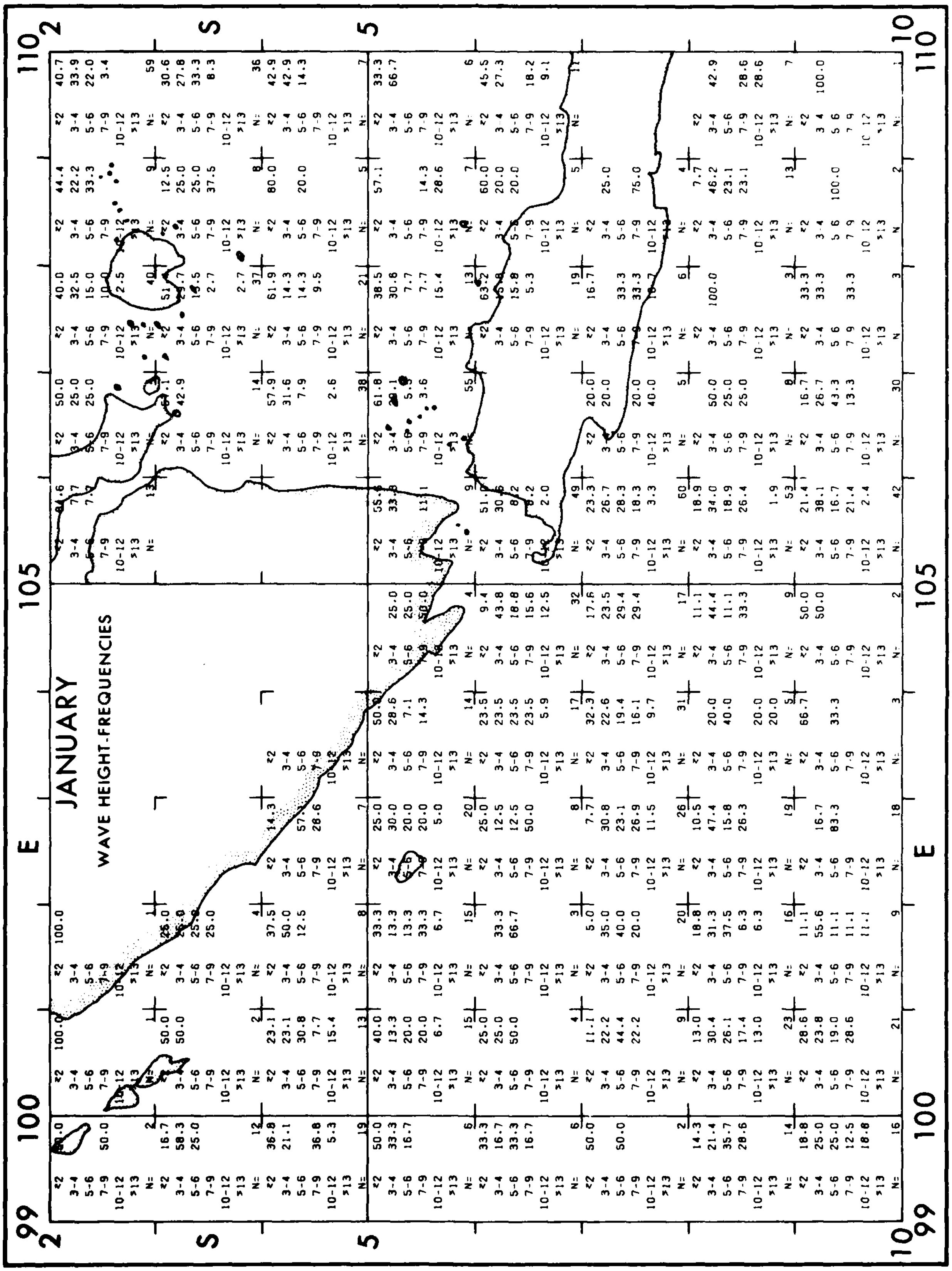


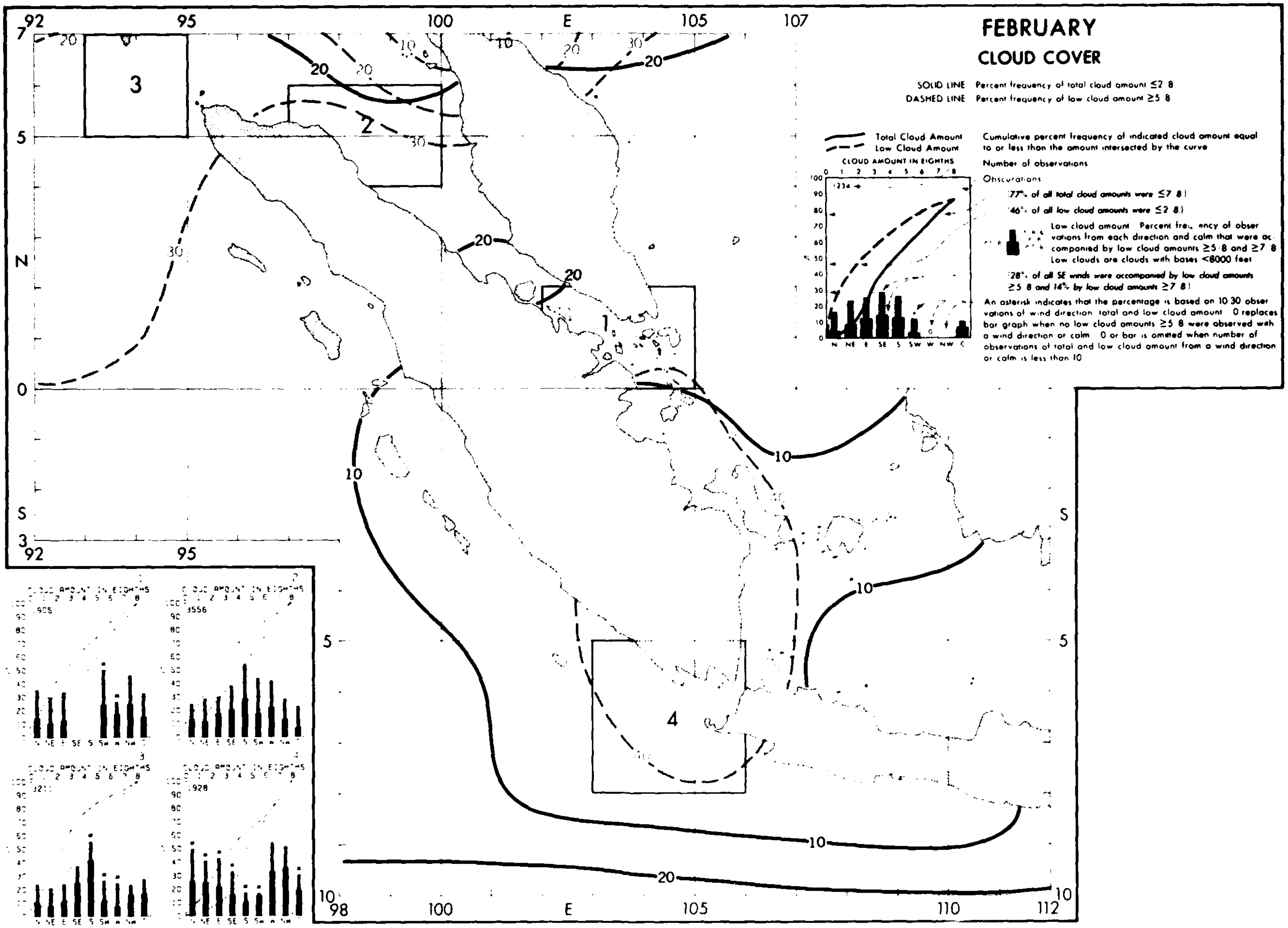
CONVERSION TABLE

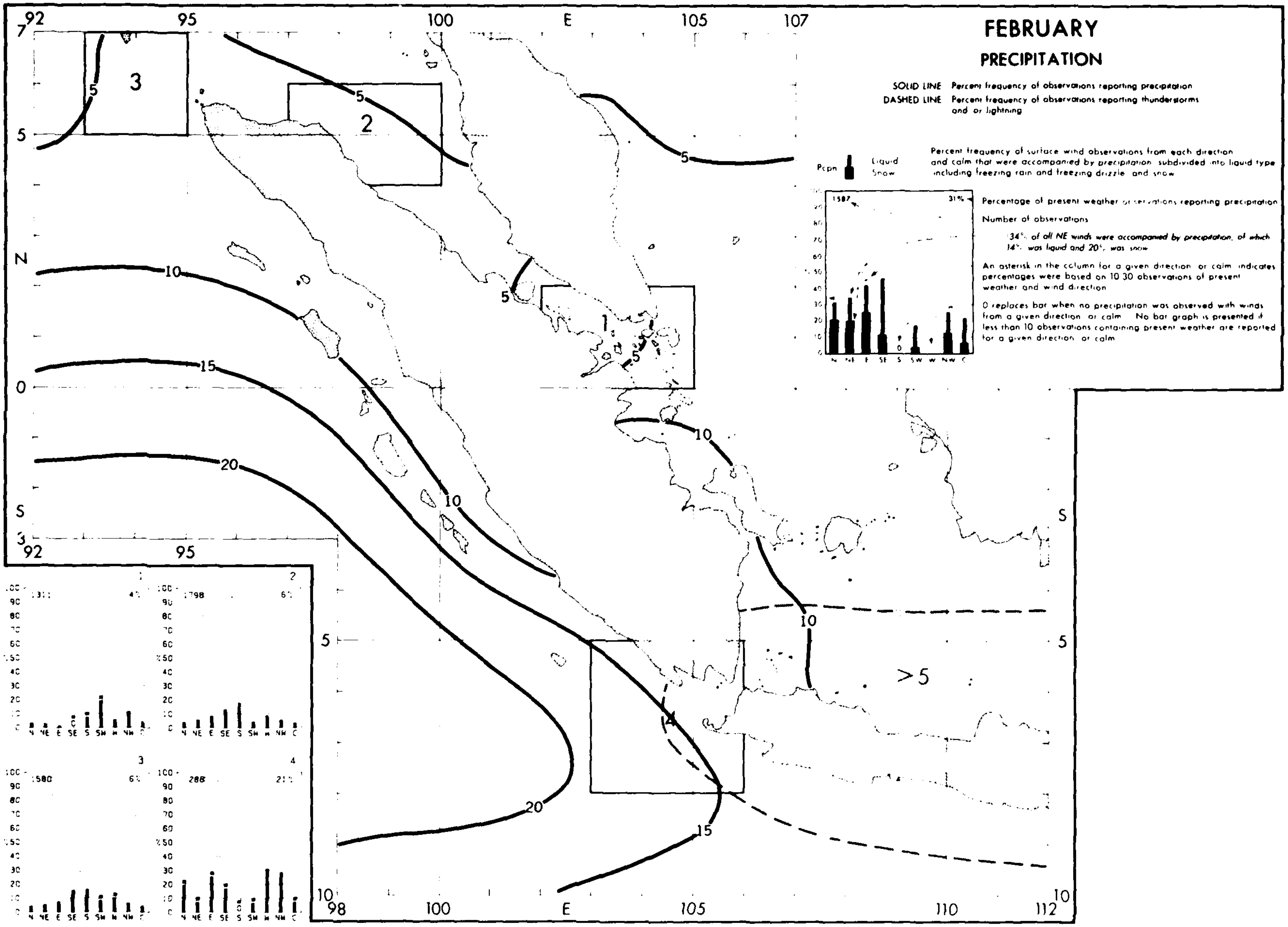
°C	°F
16	– 60.8
17	– 62.6
18	– 64.4
19	– 66.2
20	– 68.0
21	– 69.8
22	– 71.6
23	– 73.4
24	– 75.2
25	– 77.0
26	– 78.8
27	– 80.6
28	– 82.4
29	– 84.2
30	– 86.0
31	– 87.8
32	– 89.6
33	– 91.4
34	– 93.2
35	– 95.0
36	– 96.8
37	– 98.6
38	– 100.4
39	– 102.2

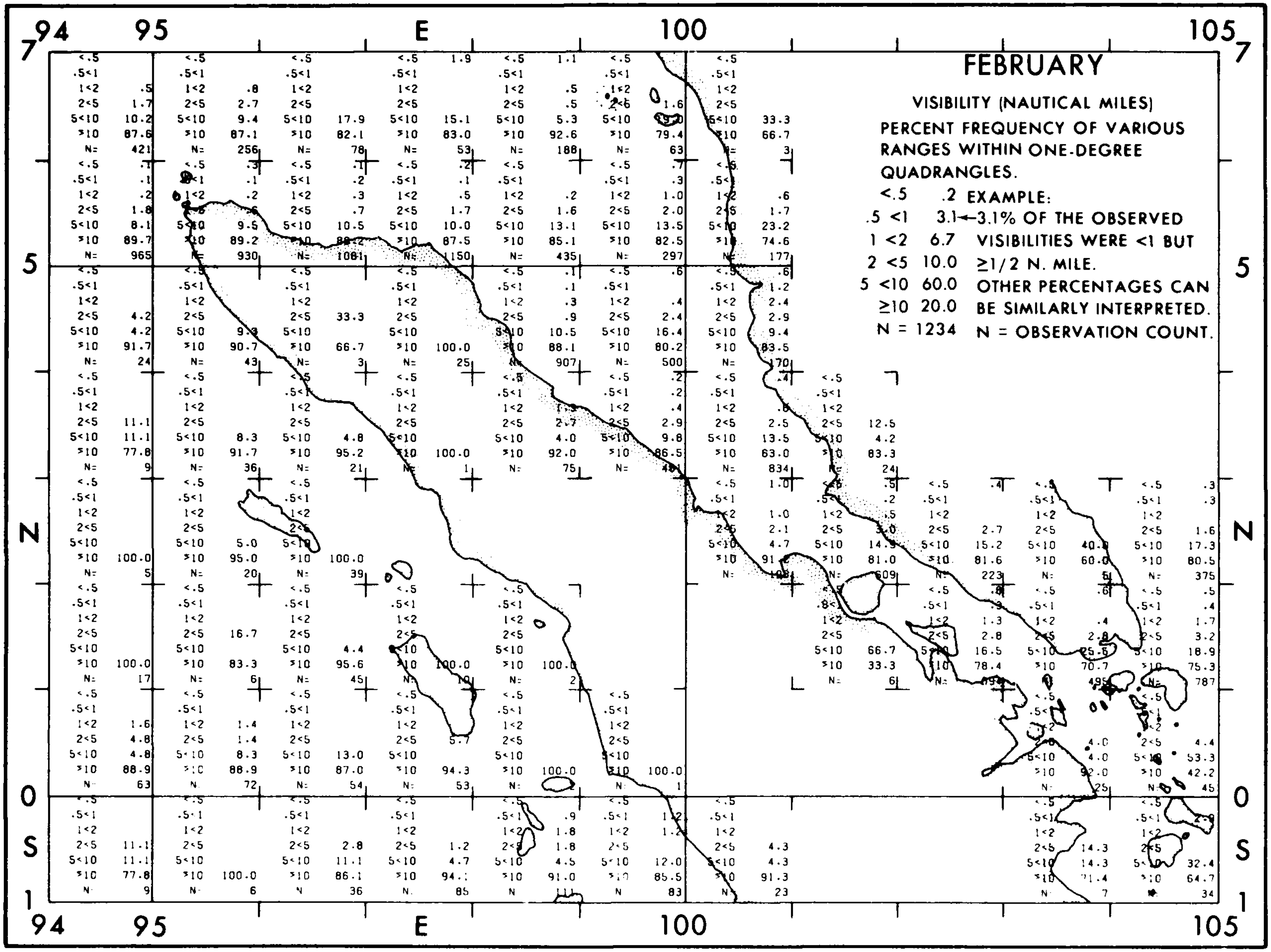

JANUARY
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency (top scale) Bars represent percent frequency of waves from each direction
Height frequency (bottom scale) Printed figures represent percent frequency of wave heights observed from each direction
5% of all waves were from the N
indicates <5% but >0
1% of all waves were from the S with heights from 6-7.5 meters
Number of observations
2% of the waves from all directions had heights ≥10 meters
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-5.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
WAVE HEIGHT (METERS)
TOTALS
CALM & INDET

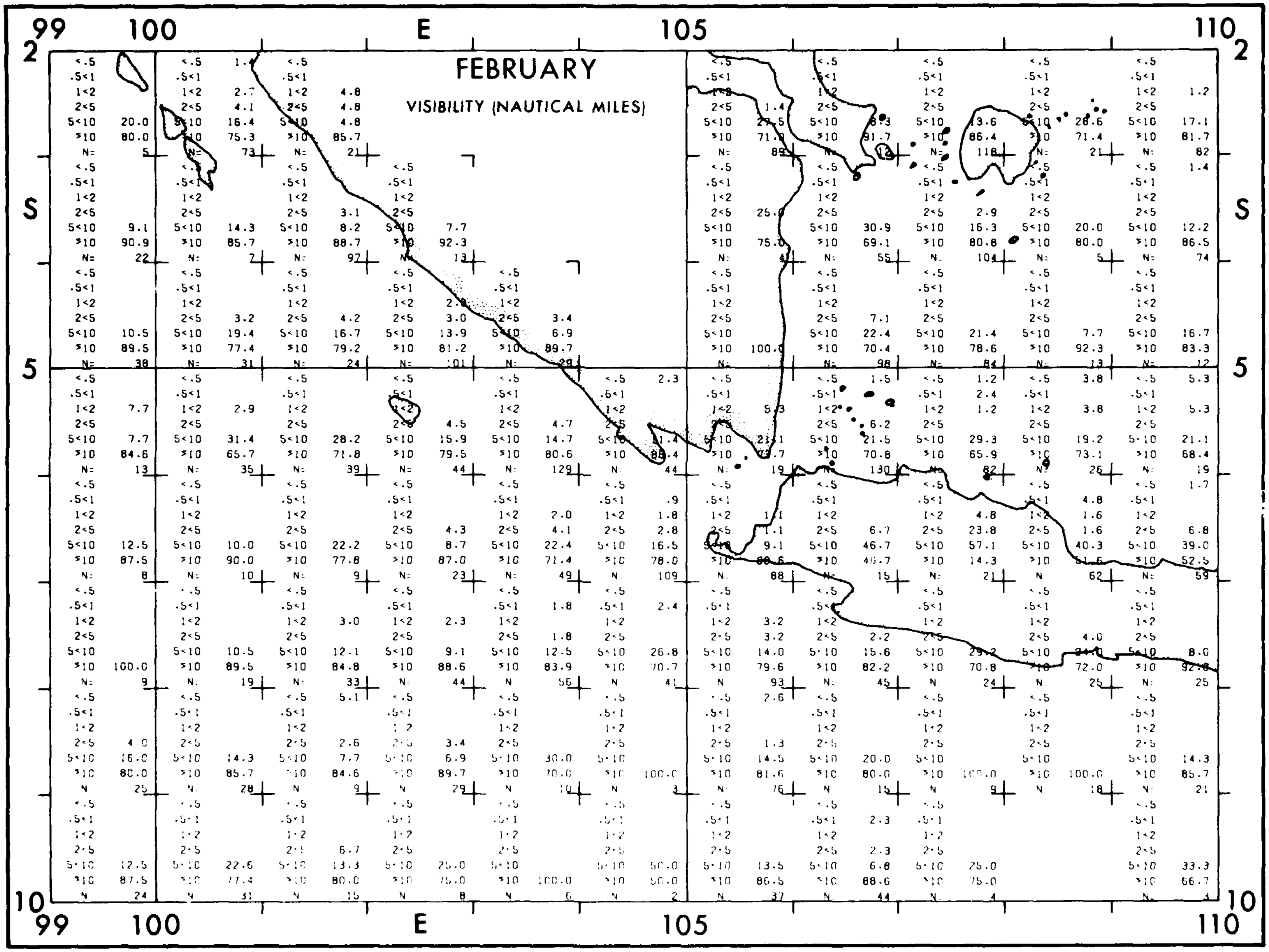

JANUARY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

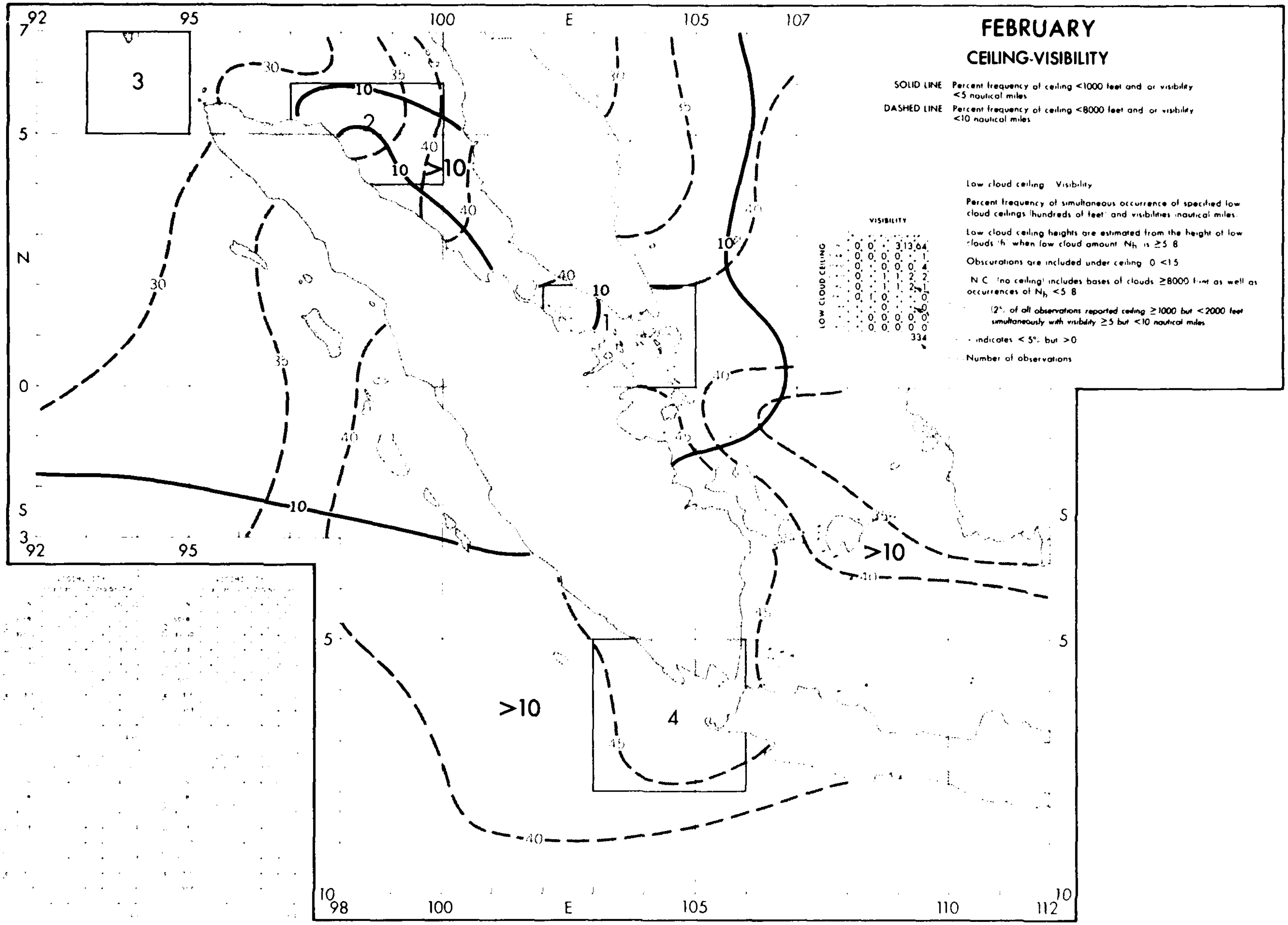

JANUARY
WAVE HEIGHT-FREQUENCIES
99
100
105
110
E
S
2
5
10

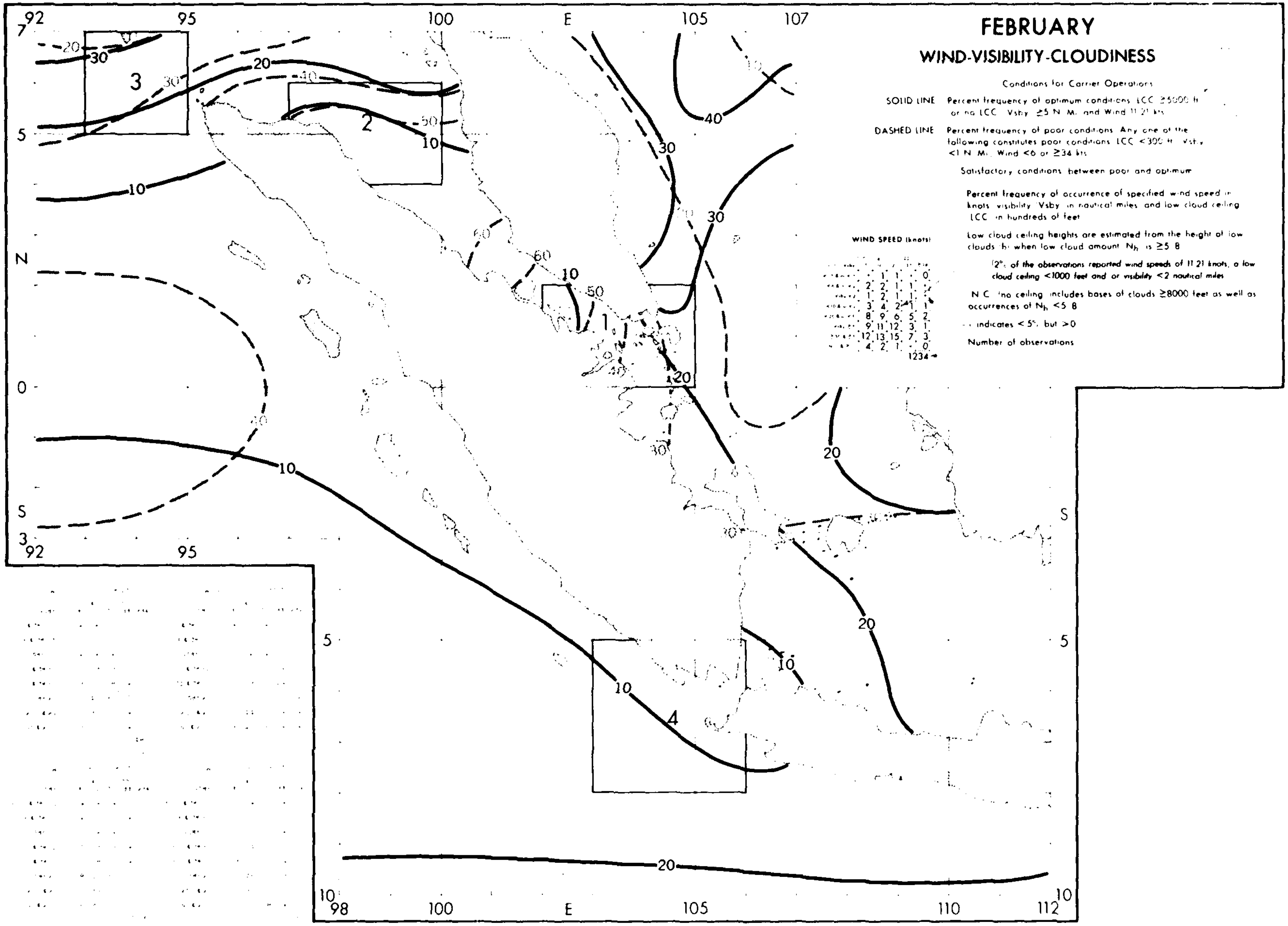

FEBRUARY
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2/8
DASHED LINE Percent frequency of low cloud amount ≥5/8
Total Cloud Amount
Low Cloud Amount
CLOUD AMOUNT IN EIGHTHS
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8)
(46% of all low cloud amounts were ≤2/8)
Low cloud amount. Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
1
2
3
4
CLOUD AMOUNT IN EIGHTHS

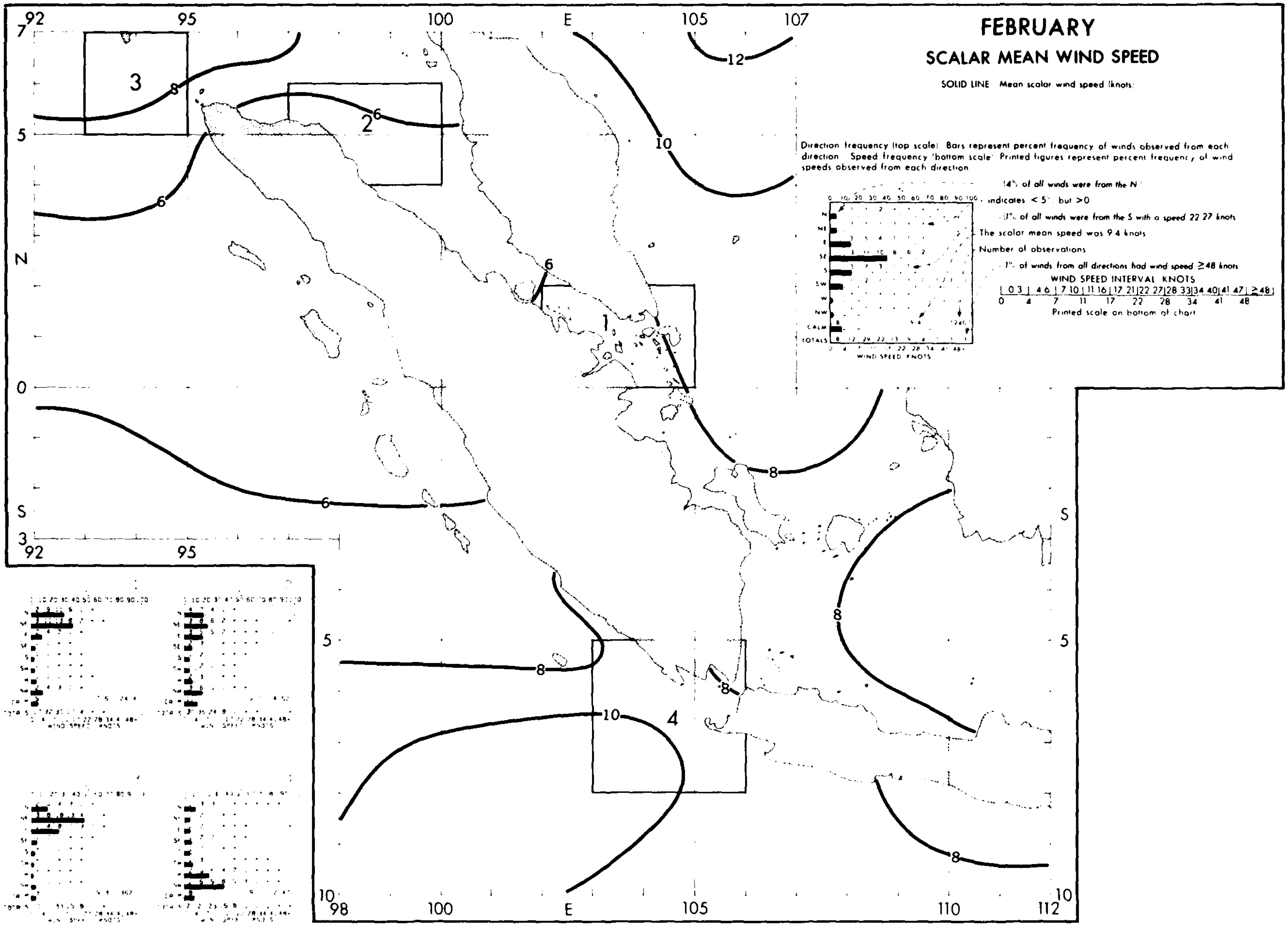

FEBRUARY
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Pcpn
Liquid
Snow
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation subdivided into liquid type including freezing rain and freezing drizzle and snow
Percentage of present weather observations reporting precipitation
Number of observations
34% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10-30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
>5


FEBRUARY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1


FEBRUARY
VISIBILITY (NAUTICAL MILES)

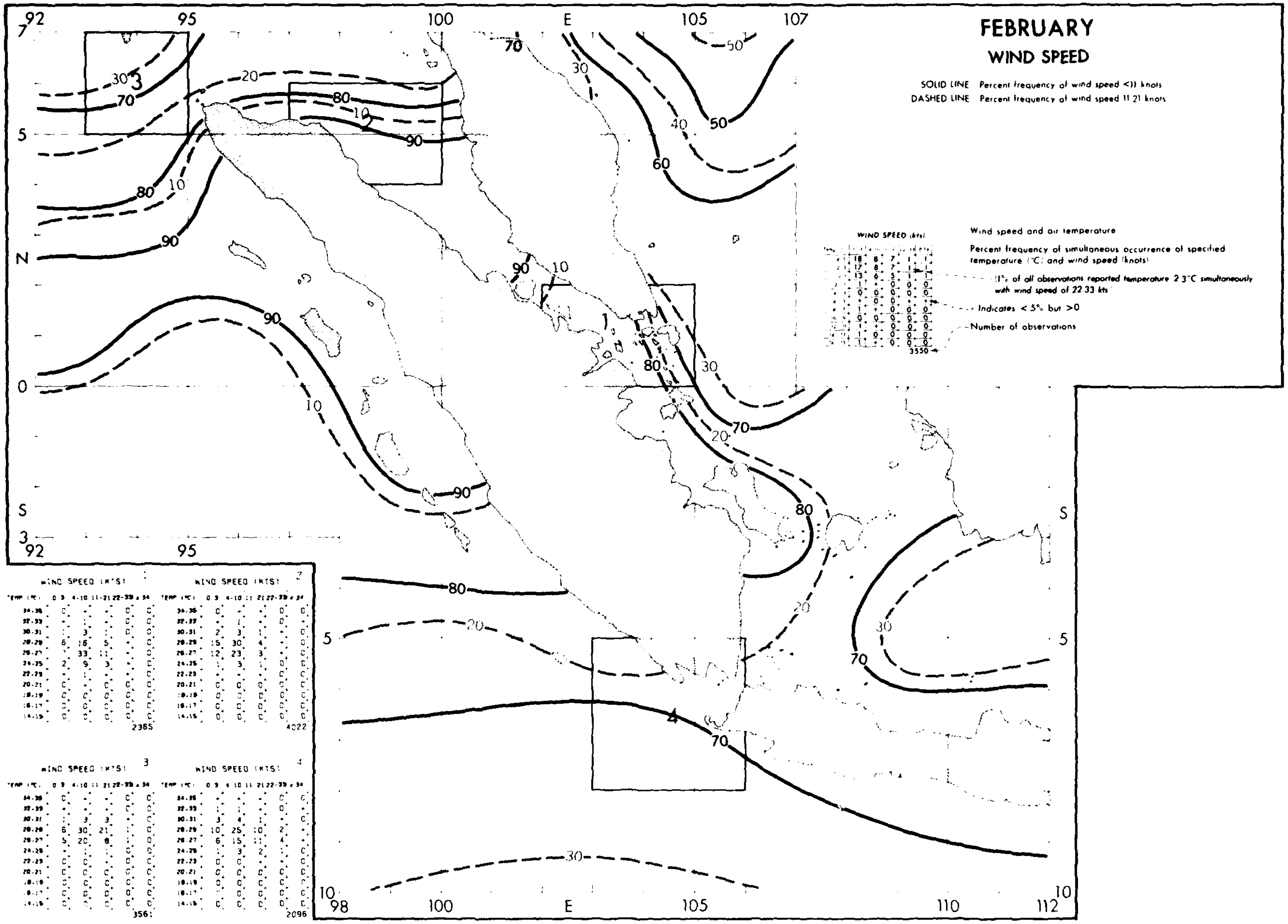

FEBRUARY
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and/or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and/or visibility <10 nautical miles
Low cloud ceiling / Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount N_h is ≥5/8
Obscurations are included under ceiling 0-<15
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of N_h <5/8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles
• indicates < 5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
>10
>10
>10
3
4


FEBRUARY
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions: LCC ≥5000 ft or no LCC, Vsby ≥5 N. Mi. and Wind 11-21 kts
DASHED LINE Percent frequency of poor conditions. Any one of the following constitutes poor conditions: LCC <300 ft, Vsby <1 N. Mi., Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles, and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (N_h) is ≥5/8
12% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and/or visibility <2 nautical miles
N.C. (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of N_h <5/8
indicates <5% but >0
Number of observations
WIND SPEED (knots)
FEBRUARY
92
95
100
E
105
107
110
112
98
N
0
S
5
10
7
3


FEBRUARY
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots)
Direction frequency (top scale) Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale) Printed figures represent percent frequency of wind speeds observed from each direction
14% of all winds were from the N
· indicates < 5% but > 0
1% of all winds were from the S with a speed 22 27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥48 knots
WIND SPEED INTERVAL KNOTS
0 3 | 4 6 | 7 10 | 11 16 | 17 21 | 22 27 | 28 33 | 34 40 | 41 47 | ≥48
0 4 7 11 17 22 28 34 41 48
Printed scale on bottom of chart
WIND SPEED KNOTS
92
95
100
105
107
110
112
98
E
N
S
0
3
5
7
10
1
2
3
4
6
8
10
12

FEBRUARY
WIND SPEED

SOLID LINE Percent frequency of wind speed <11 knots
DASHED LINE Percent frequency of wind speed 11-21 knots



WIND SPEED (KTS) 1

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	0	+	+	0	0
32-33	+	1	+	0	0
30-31	1	3	1	0	0
28-29	6	16	5	+	0
26-27	7	33	11	+	0
24-25	2	9	3	+	0
22-23	+	1	+	+	0
20-21	0	+	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0
					2365

WIND SPEED (KTS) 2

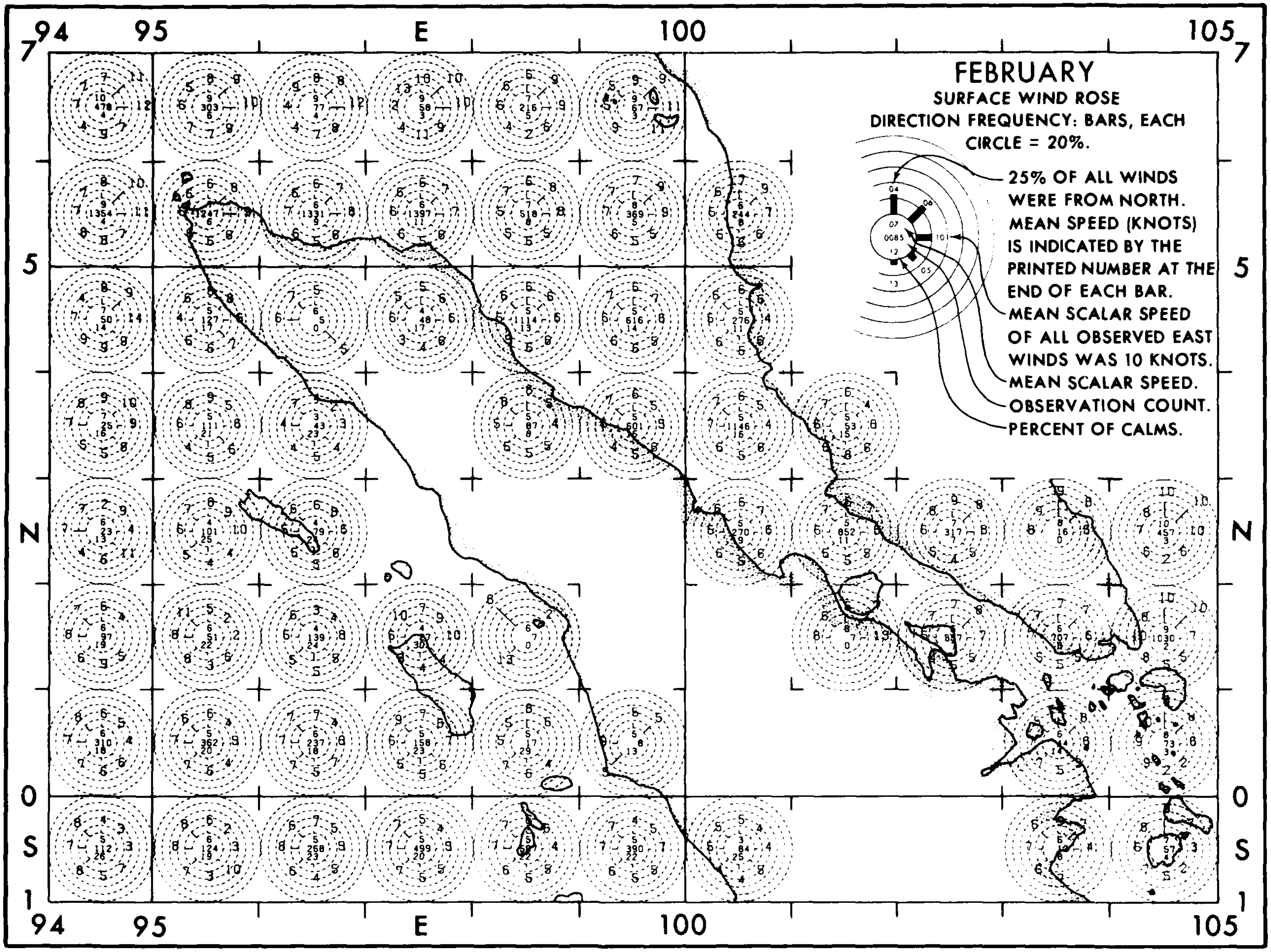
TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	0	+	+	0	0
32-33	+	1	+	0	+
30-31	2	3	1	+	0
28-29	15	30	4	+	0
26-27	12	23	3	+	0
24-25	1	3	1	0	0
22-23	+	+	+	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0
					4022

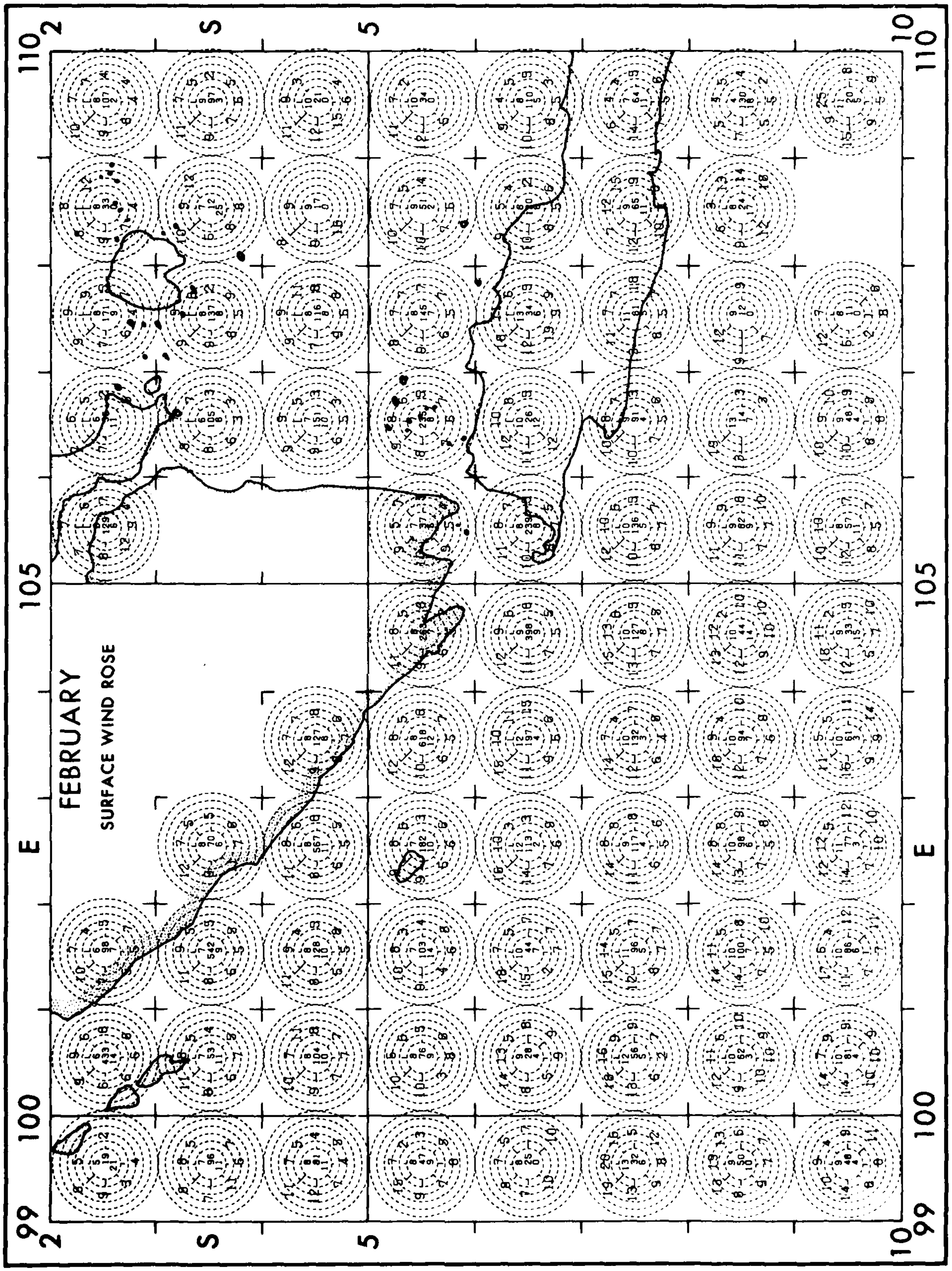
WIND SPEED (KTS) 3

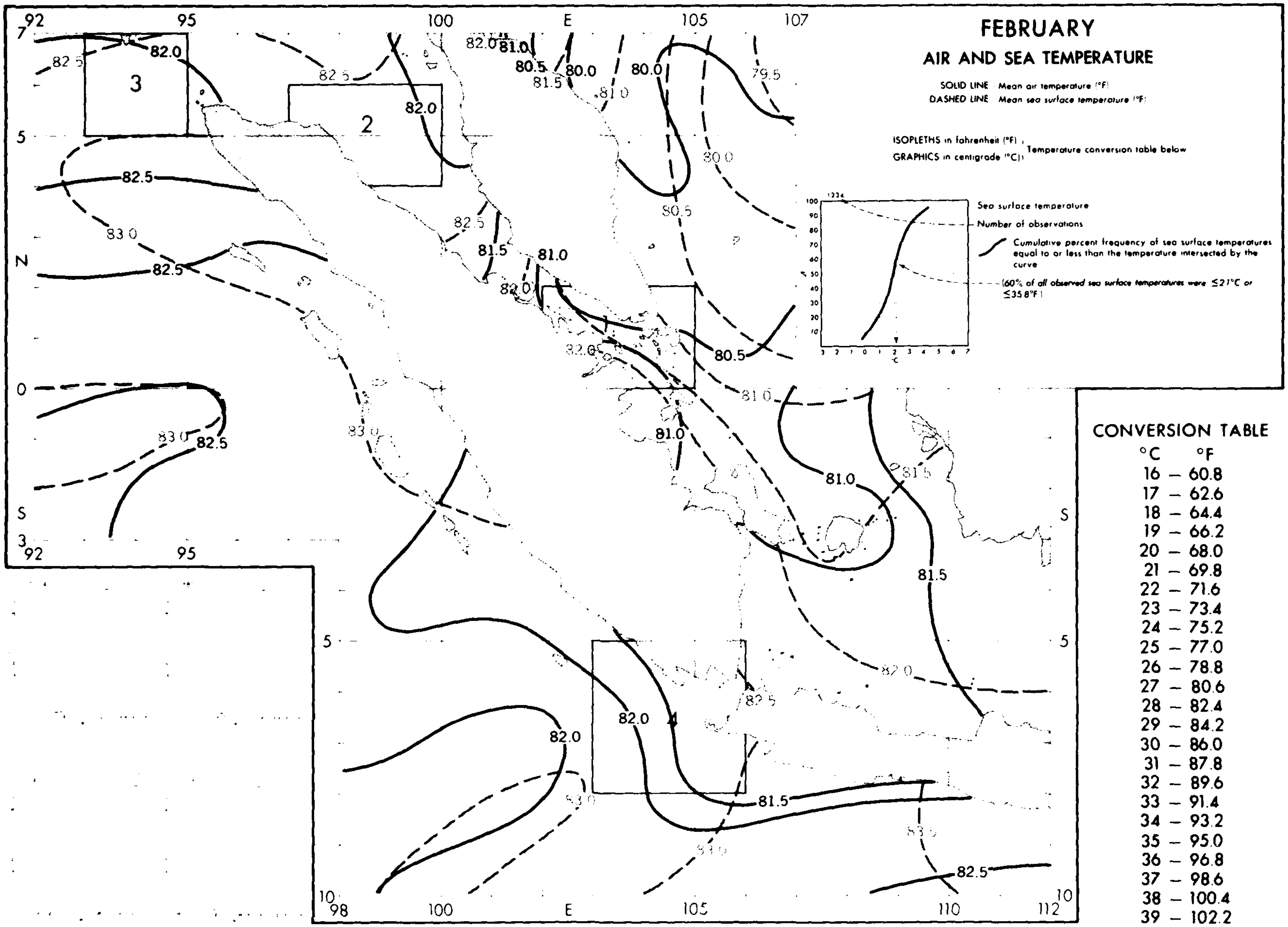
TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	0	+	+	0	0
32-33	+	+	+	0	0
30-31	1	3	3	+	0
28-29	6	30	21	1	0
26-27	5	20	8	1	0
24-25	+	1	1	0	0
22-23	0	0	+	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0
					3561

WIND SPEED (KTS) 4

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	+	+	+	0	0
32-33	1	1	+	0	+
30-31	3	4	1	+	0
28-29	10	25	10	2	+
26-27	6	15	11	4	+
24-25	1	3	2	1	0
22-23	0	0	+	+	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0
					2096

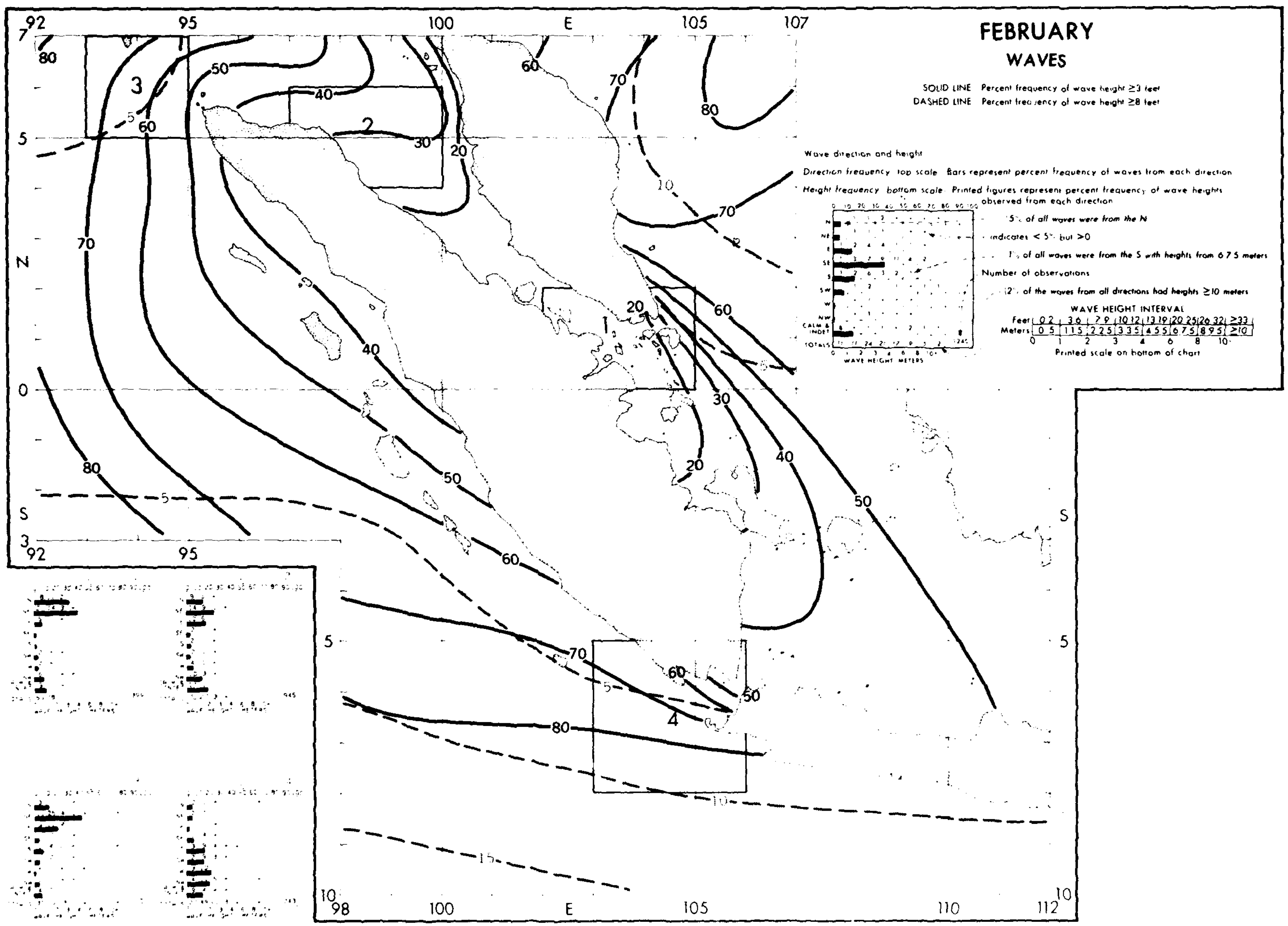

FEBRUARY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
E
100
105
7
5
N
0
S
1

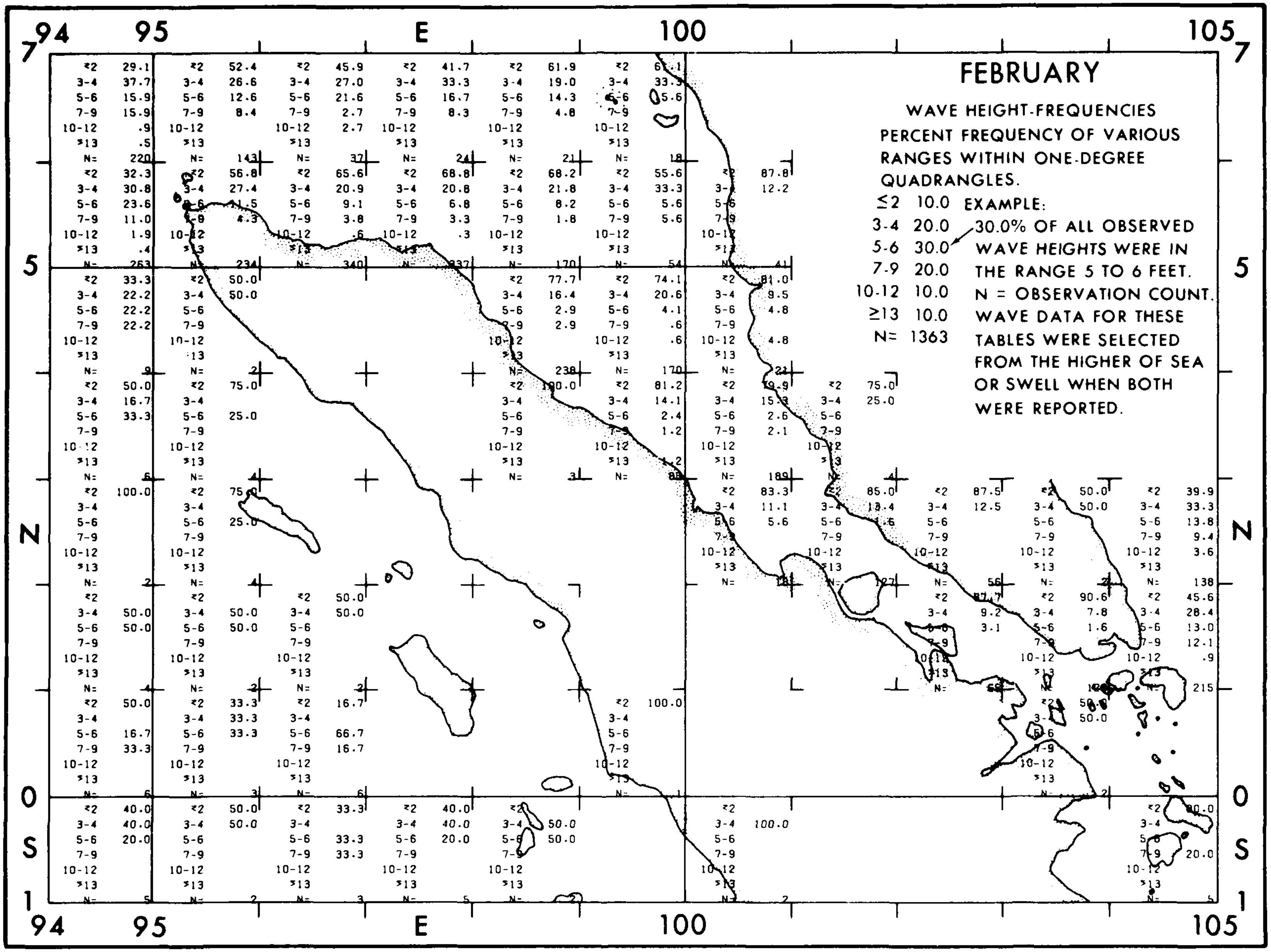

FEBRUARY
SURFACE WIND ROSE
99
100
E
105
110
2
S
5
10



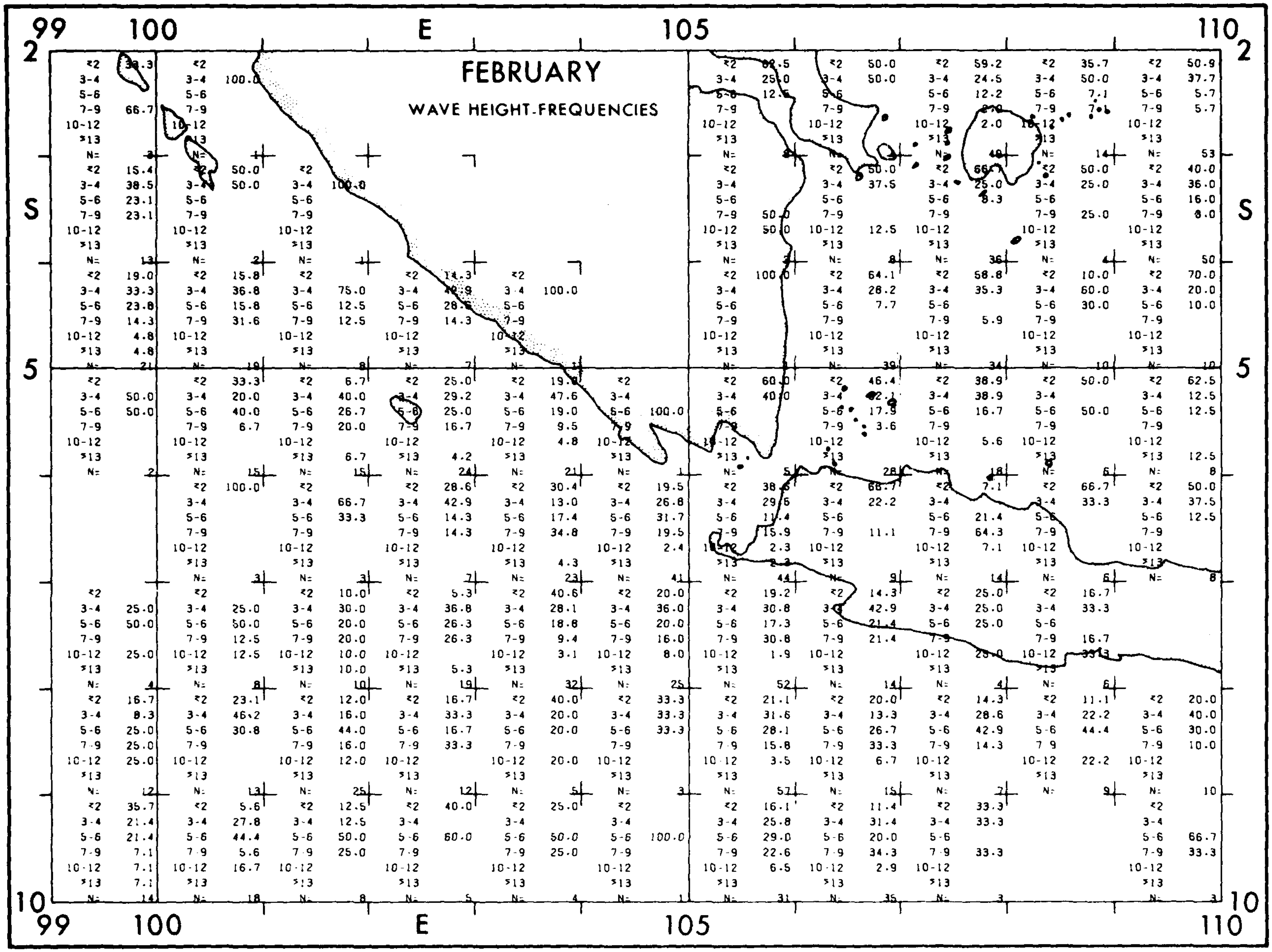
CONVERSION TABLE

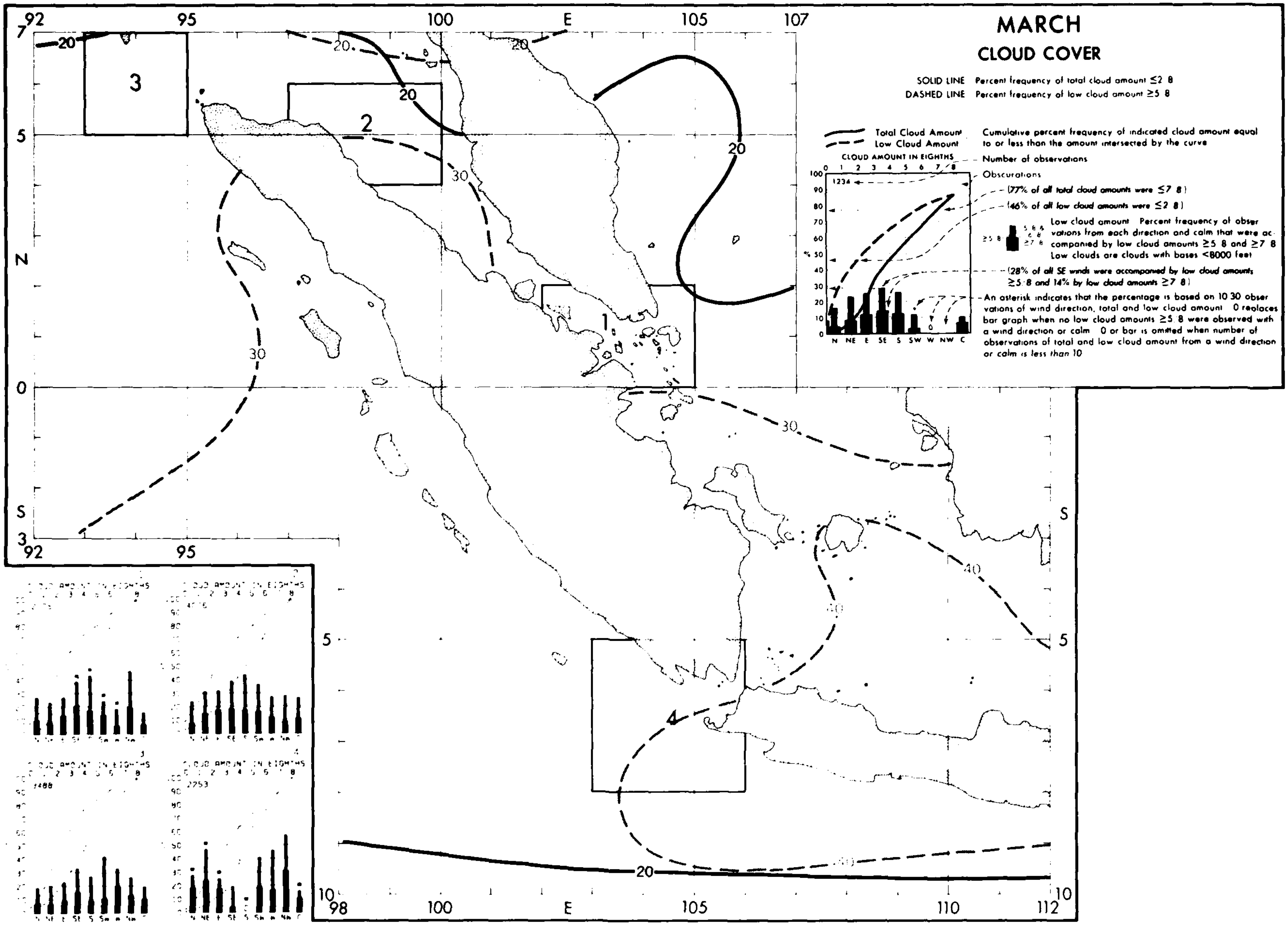
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2


FEBRUARY
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency top scale Bars represent percent frequency of waves from each direction
Height frequency bottom scale Printed figures represent percent frequency of wave heights observed from each direction
5% of all waves were from the N
indicates < 5% but >0
1% of all waves were from the S with heights from 6-7.5 meters
Number of observations
2% of the waves from all directions had heights ≥10 meters
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-5.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
WAVE HEIGHT METERS



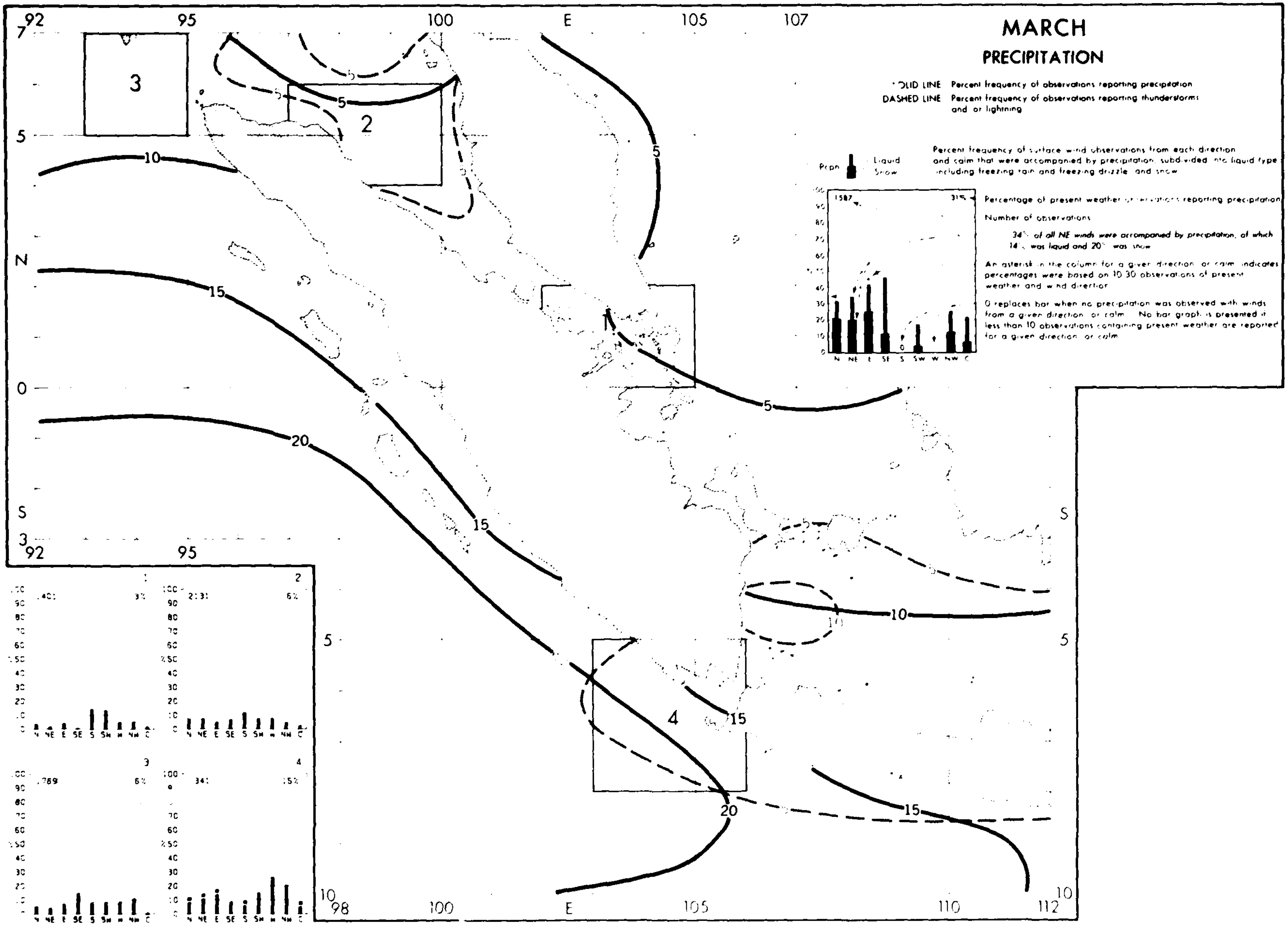
FEBRUARY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0
5-6 30.0 30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
7-9 20.0
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0
N= 1363
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
94 95 E 100 105
7 5 N 0 S 1

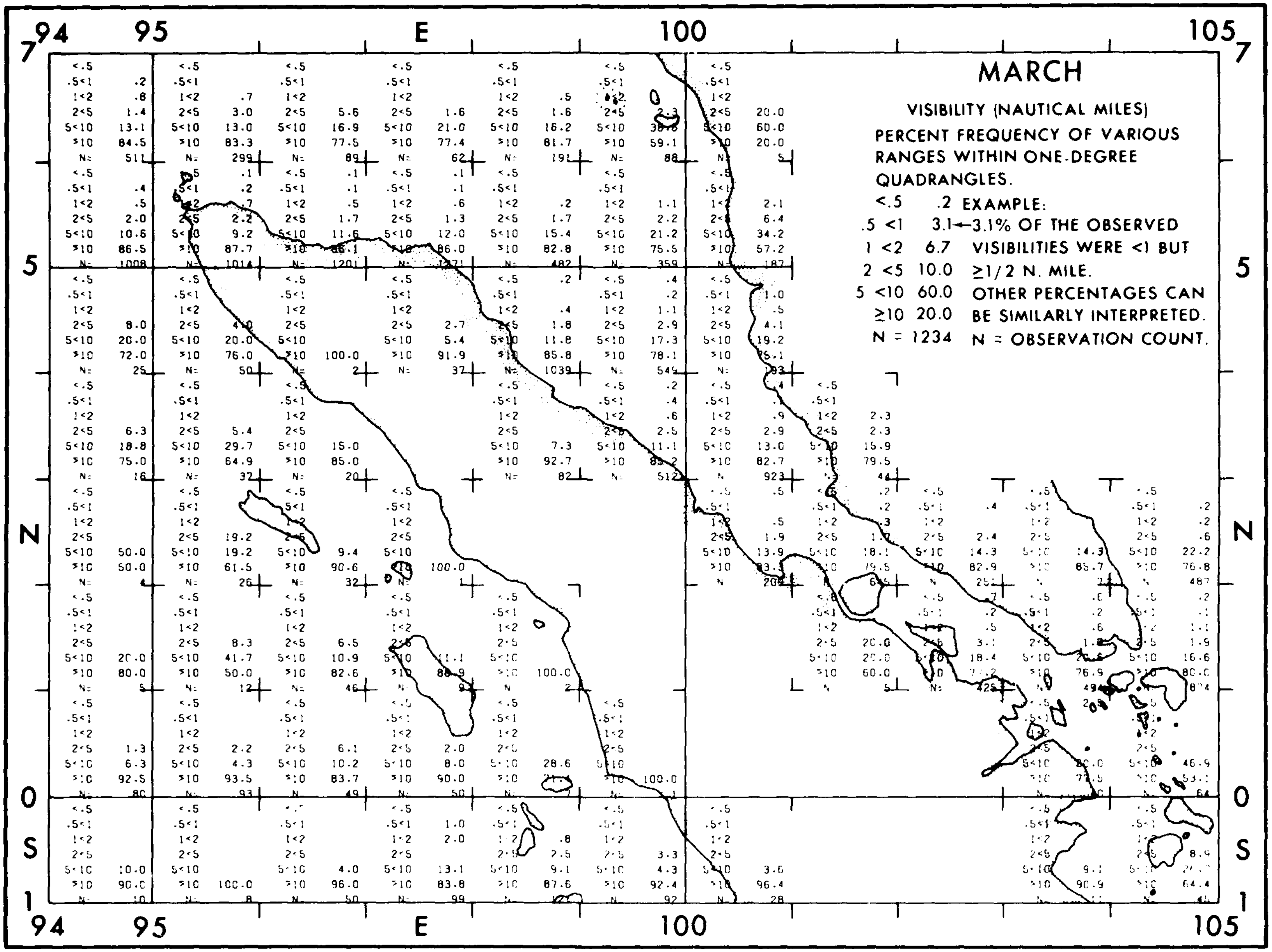

FEBRUARY
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10

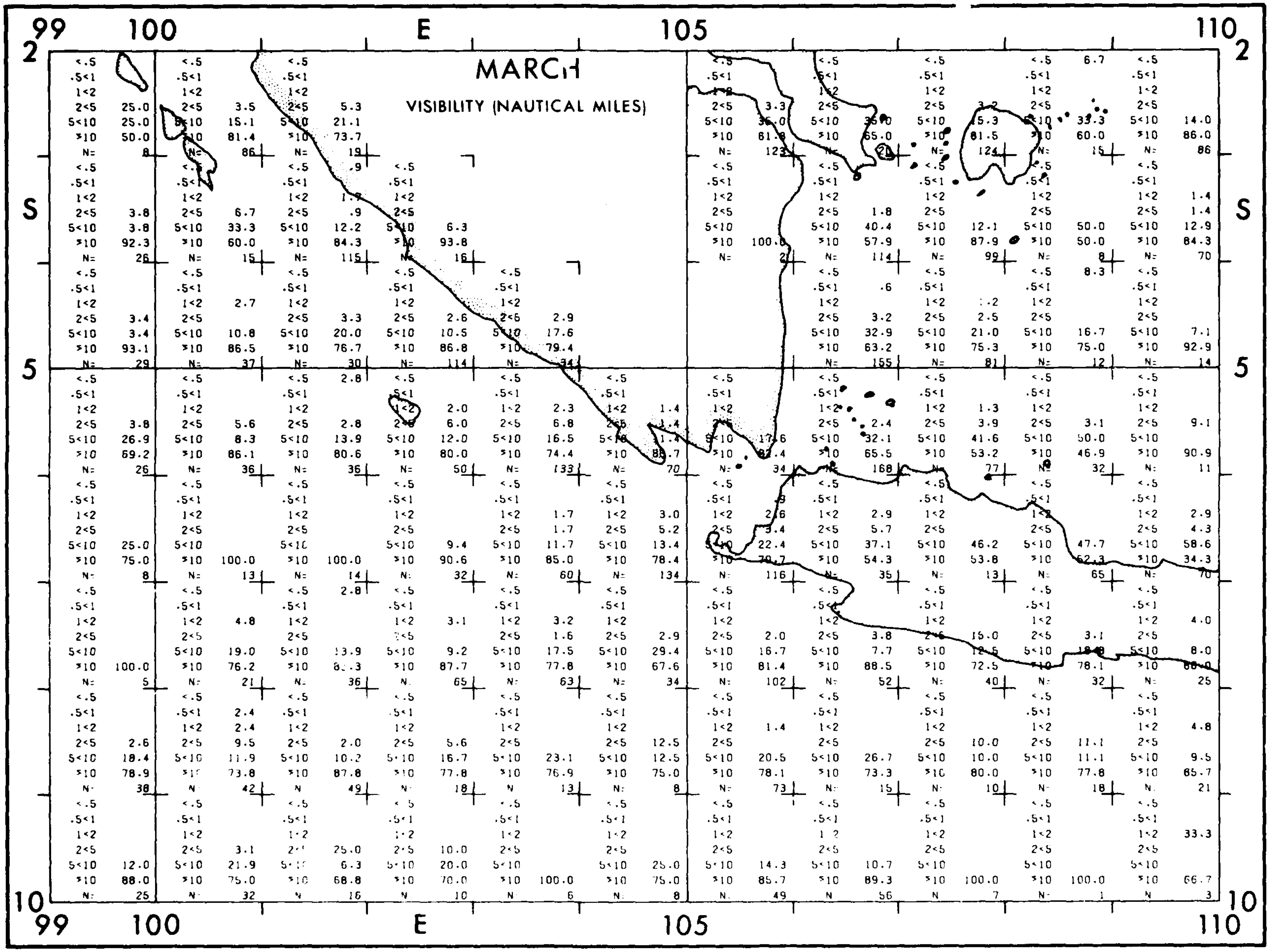

MARCH
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2 8
DASHED LINE Percent frequency of low cloud amount ≥5 8
Total Cloud Amount
Low Cloud Amount
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
CLOUD AMOUNT IN EIGHTHS
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7 8)
(46% of all low cloud amounts were ≤2 8)
Low cloud amount Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5 8 and ≥7 8 Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5 8 and 14% by low cloud amounts ≥7 8)
An asterisk indicates that the percentage is based on 10 30 observations of wind direction, total and low cloud amount 0 replaces bar graph when no low cloud amounts ≥5 8 were observed with a wind direction or calm 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
N NE E SE S SW W NW C
92
95
100
105
107
110
112
98
E
N
S
0
5
7
3
10
20
30
40
1
2
3
4
CLOUD AMOUNT IN EIGHTHS
1234
4116
1488
2753

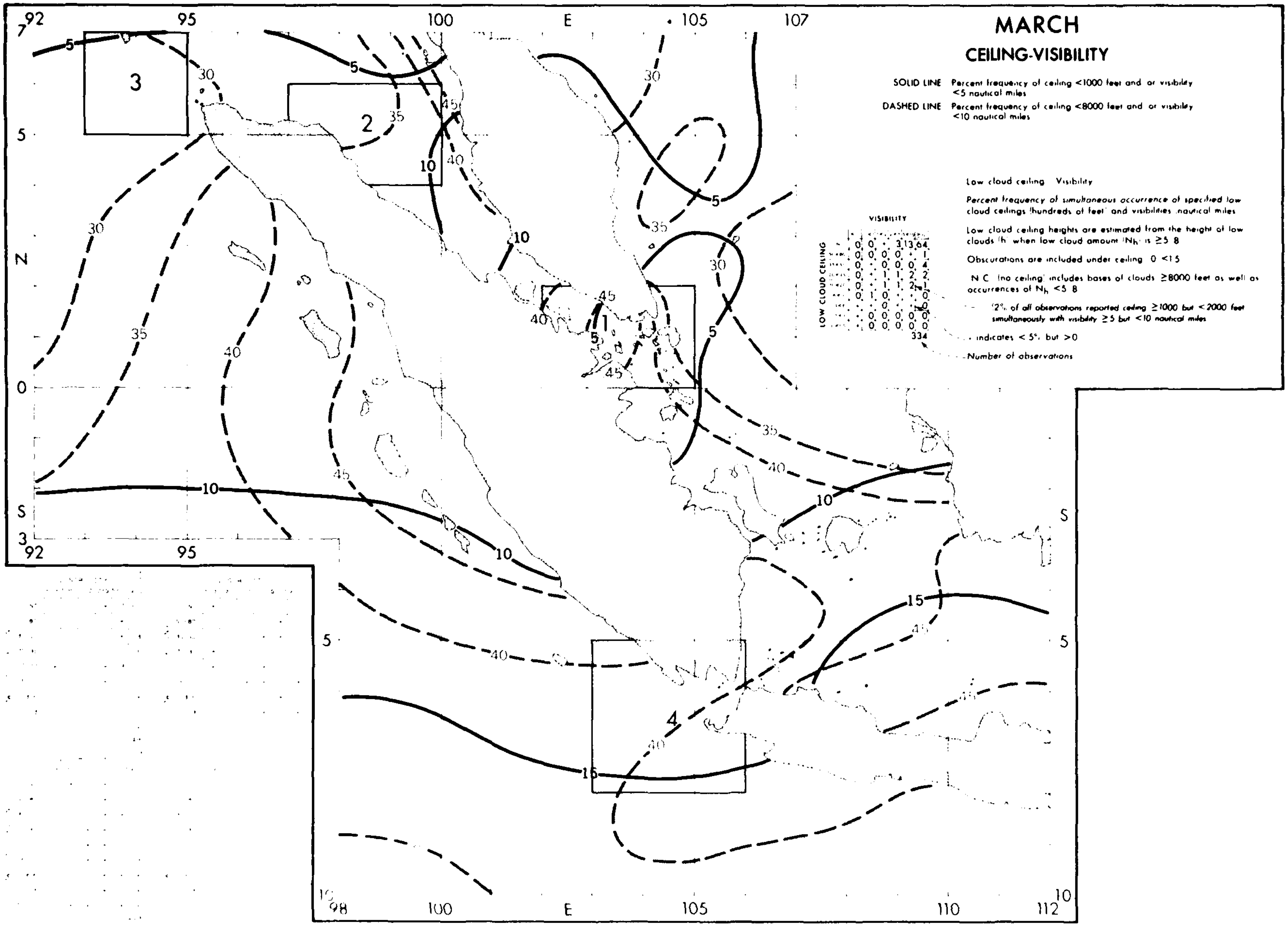
MARCH

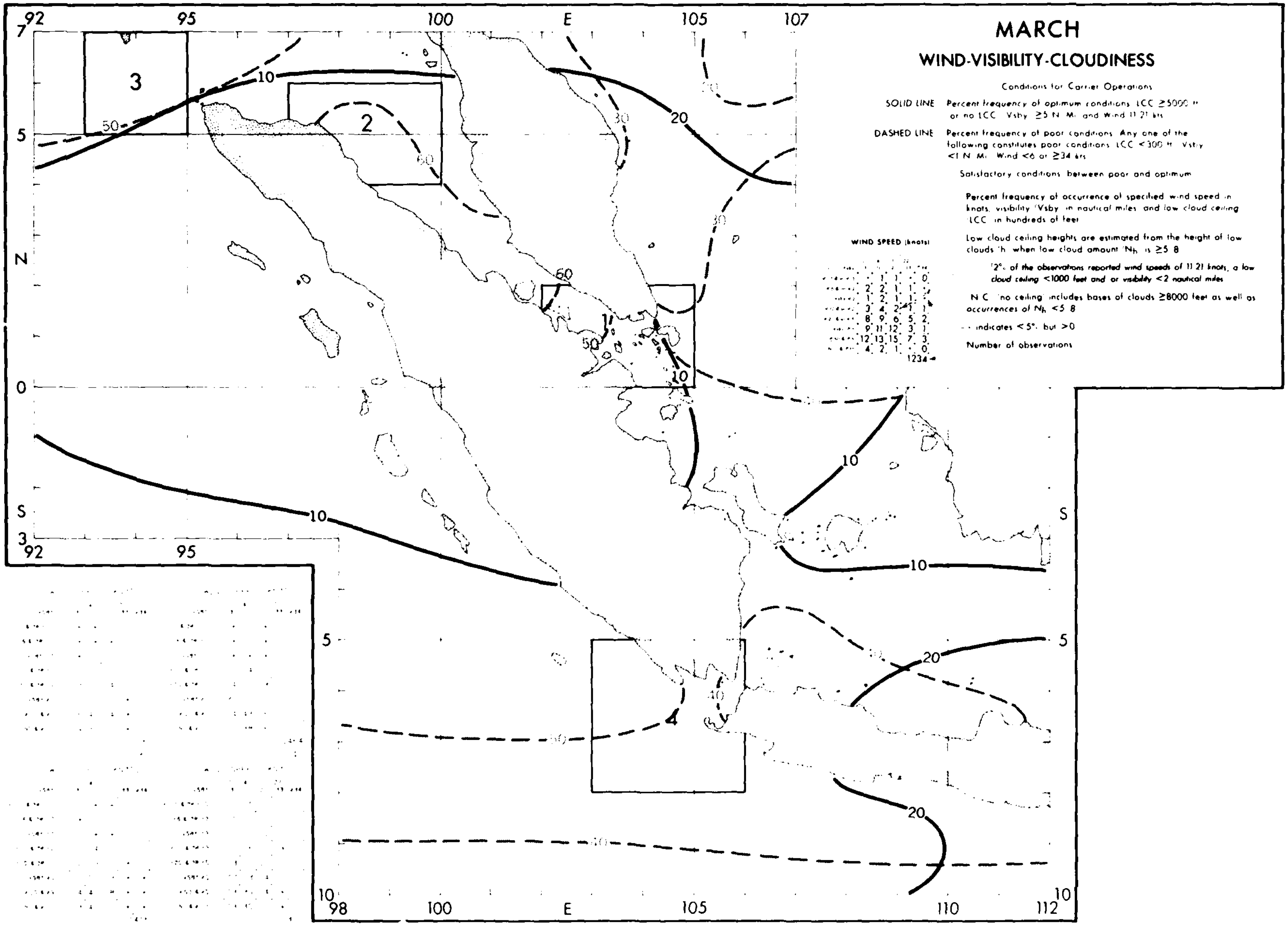
PRECIPITATION

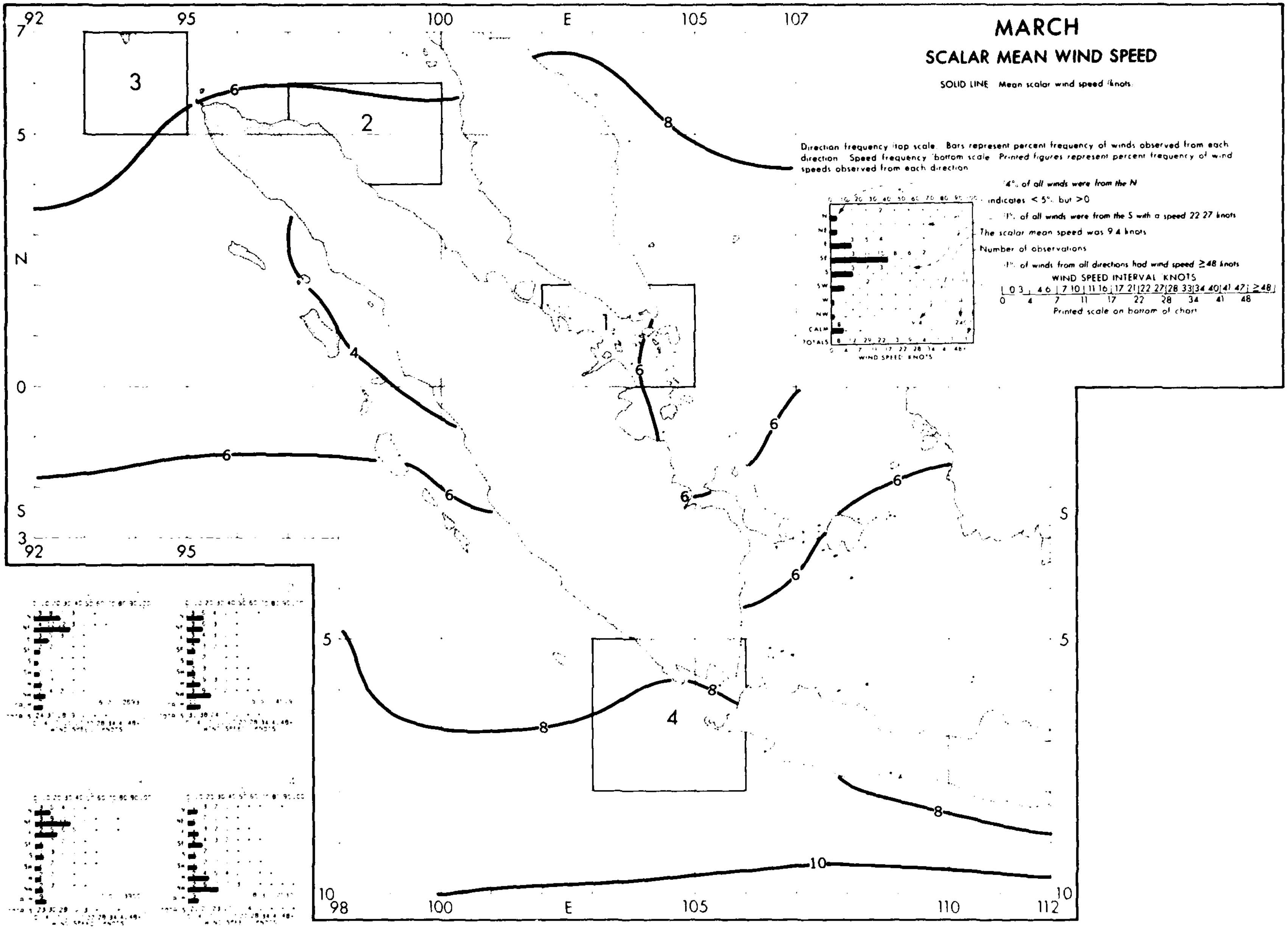


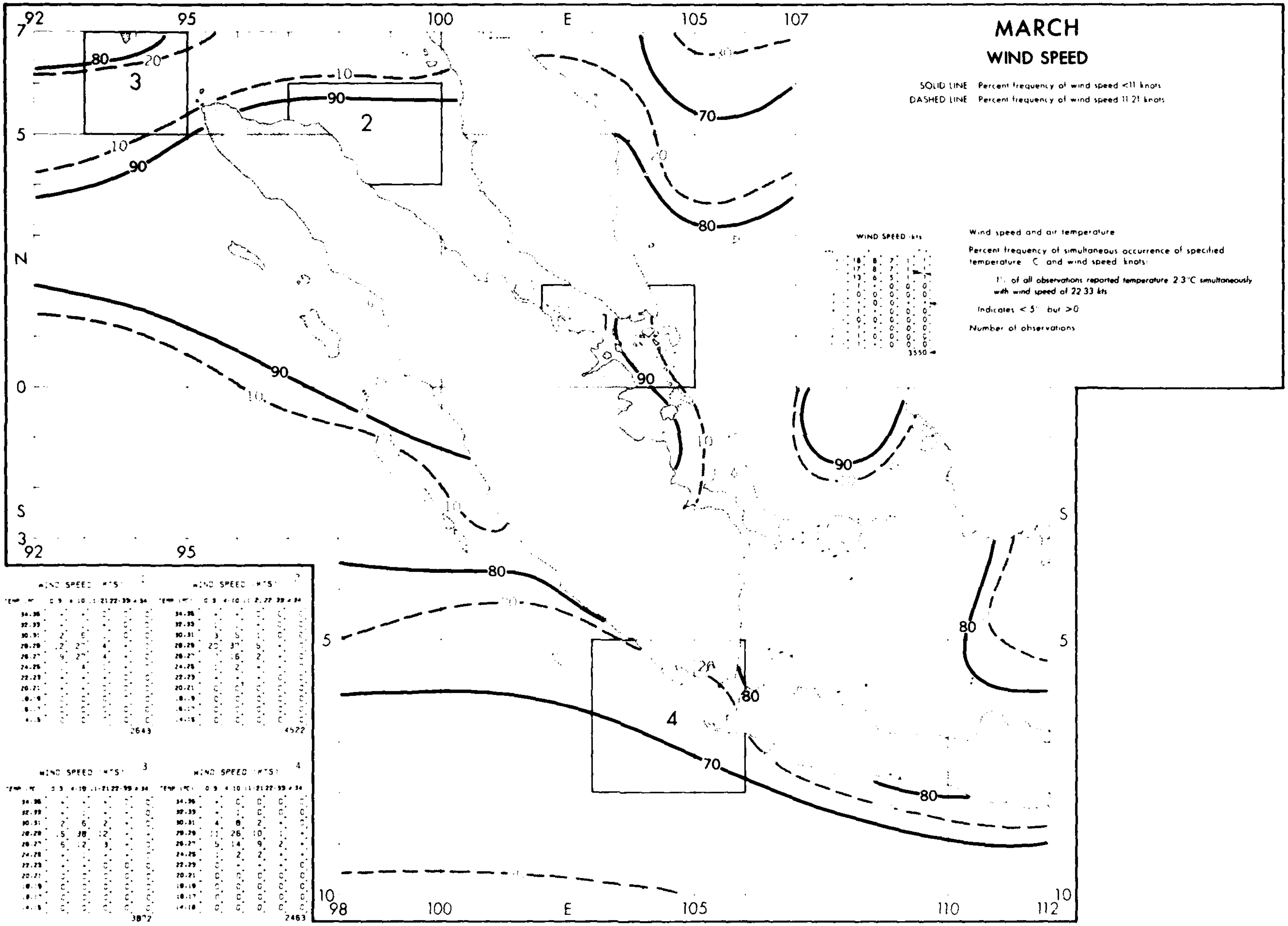

MARCH
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1

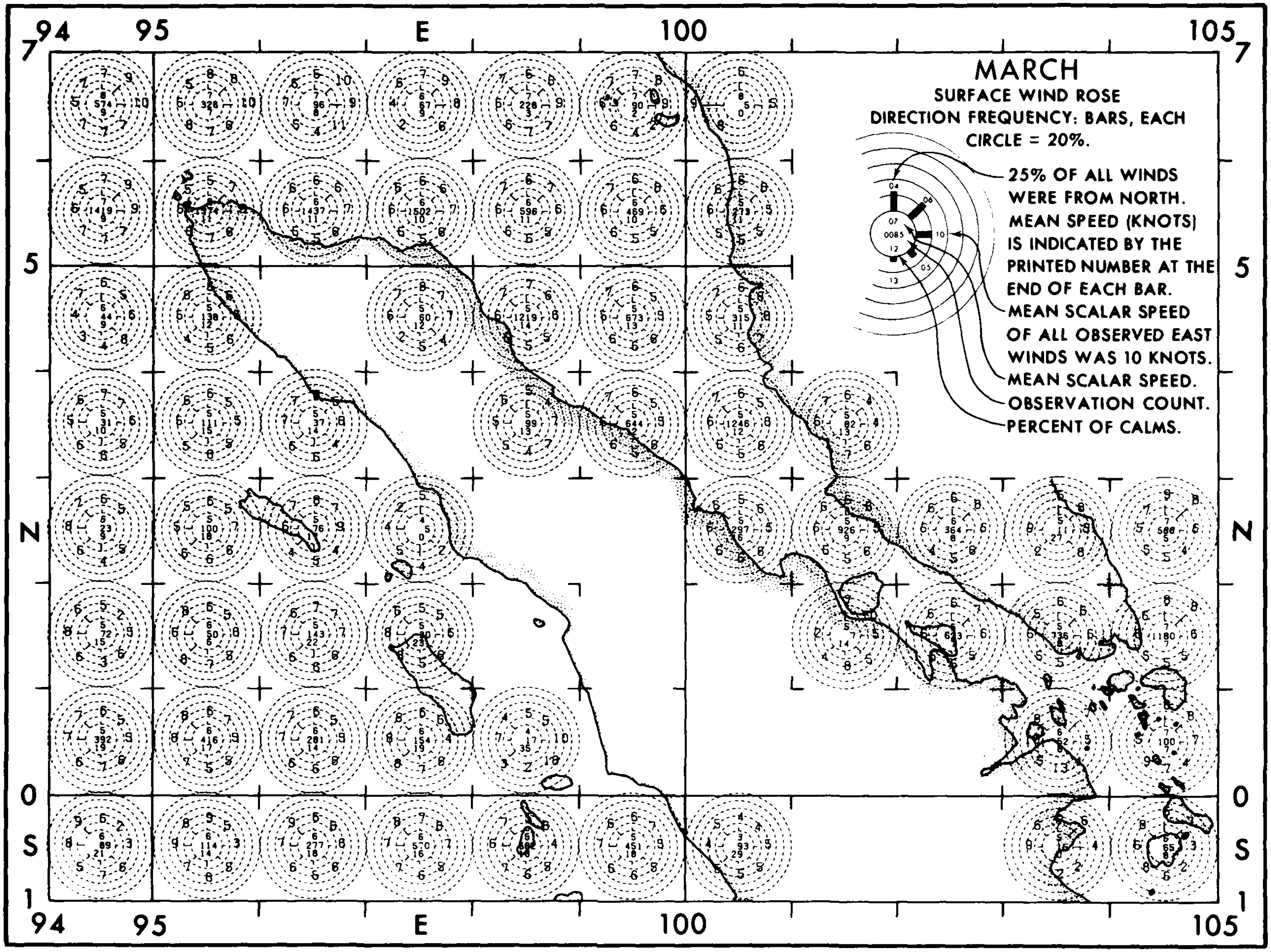

MARCH
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10

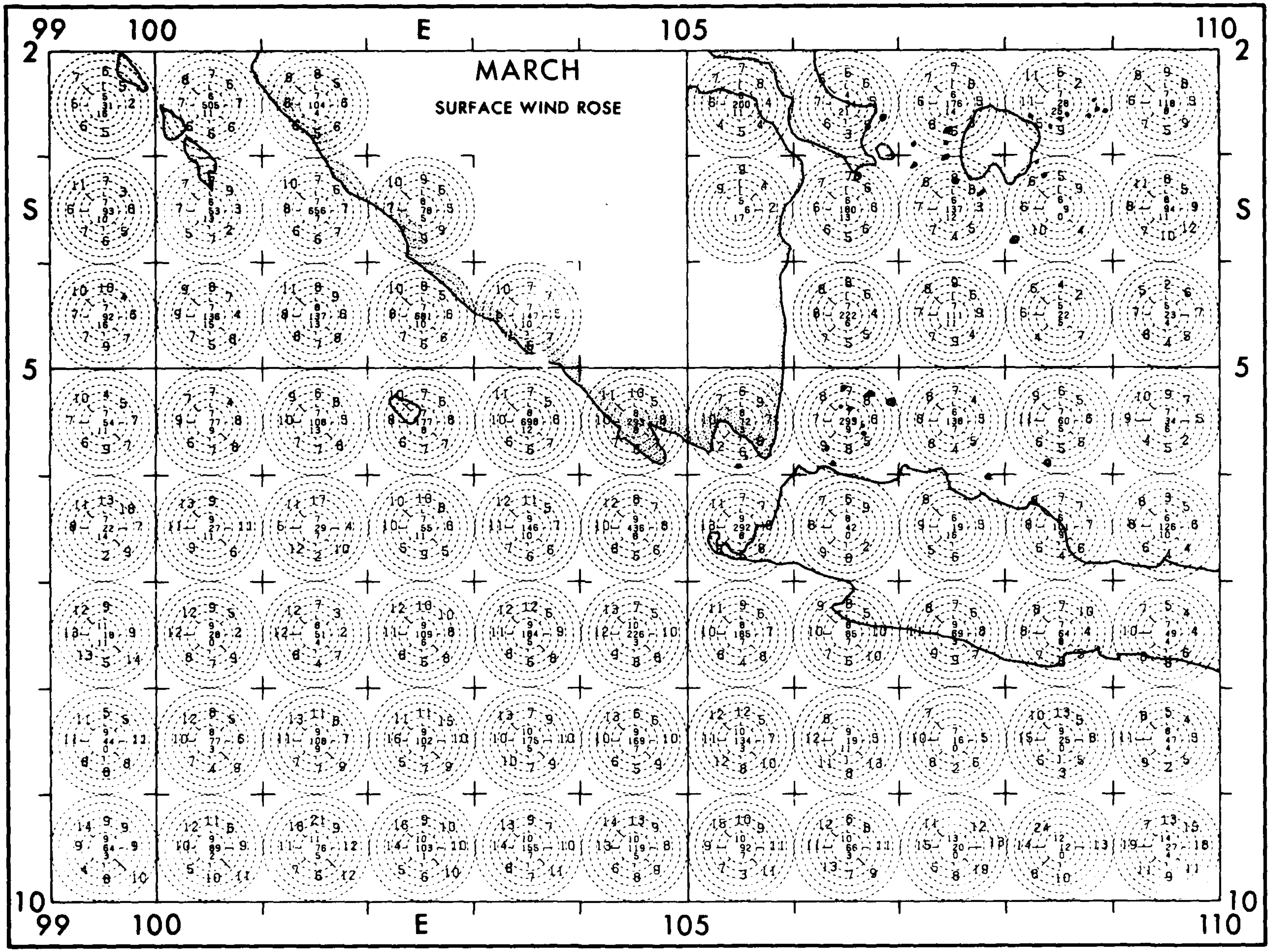

MARCH
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and/or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and/or visibility <10 nautical miles
Low cloud ceiling / Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5/8
Obscurations are included under ceiling 0-<1.5
N.C. (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5/8
indicates < 5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING

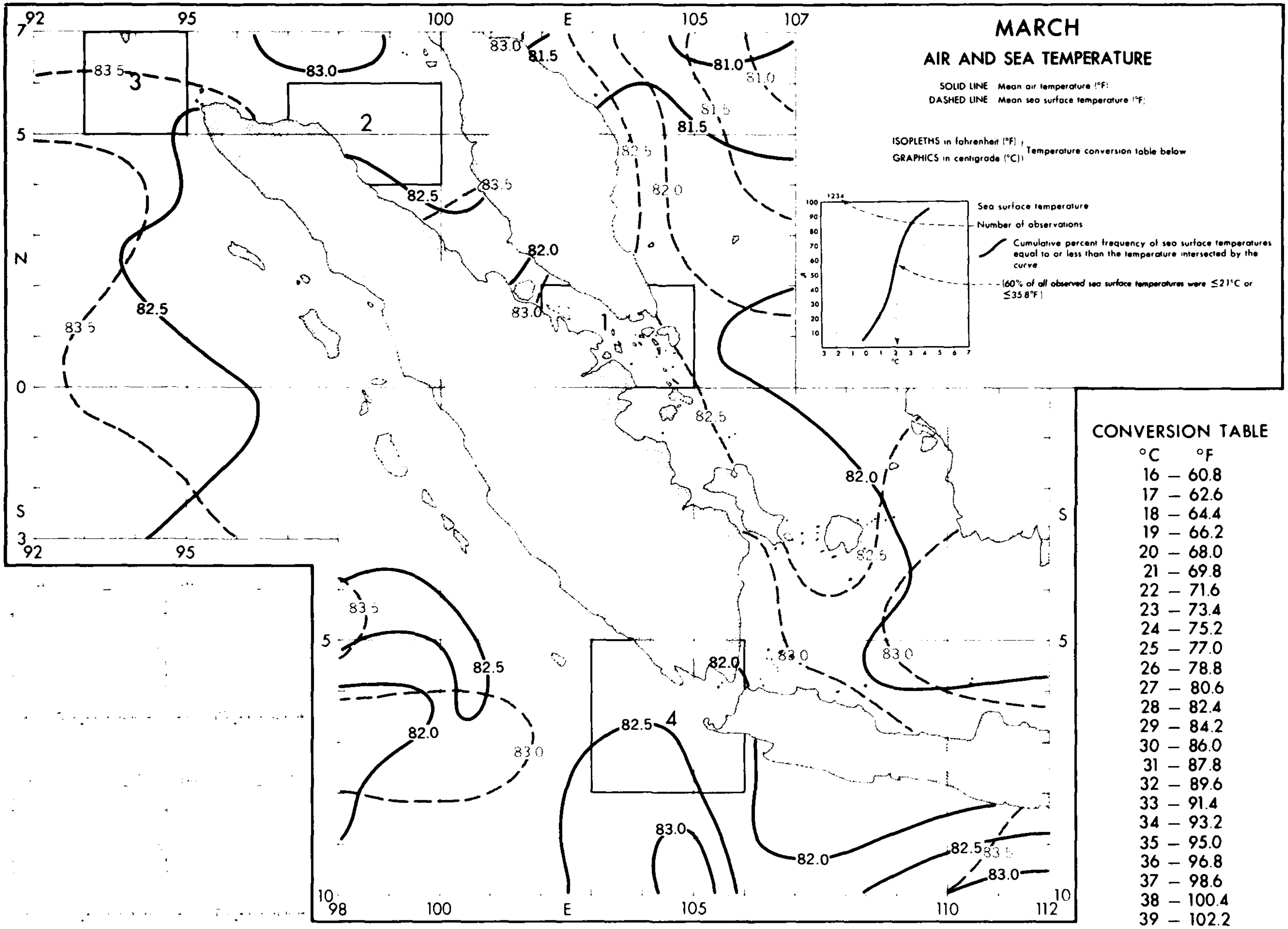

MARCH
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft or no LCC Vsby ≥5 N. Mi. and Wind 11-21 kts
DASHED LINE Percent frequency of poor conditions. Any one of the following constitutes poor conditions LCC <300 ft Vsby <1 N. Mi. Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5/8
12% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and/or visibility <2 nautical miles
N.C. (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5/8
indicates <5% but >0
Number of observations
WIND SPEED (knots)
1234
1
2
3
4
N
E
S
0
5
10
92
95
98
100
105
107
110
112


MARCH
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots)
Direction frequency (top scale). Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale). Printed figures represent percent frequency of wind speeds observed from each direction.
14% of all winds were from the N
indicates < 5% but > 0
1% of all winds were from the S with a speed 22 27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥48 knots
WIND SPEED INTERVAL KNOTS
0 3 | 4 6 | 7 10 | 11 16 | 17 21 | 22 27 | 28 33 | 34 40 | 41 47 | ≥48
0 4 7 11 17 22 28 34 41 48
Printed scale on bottom of chart
WIND SPEED KNOTS
1
2
3
4
92
95
100
E
105
107
98
110
112
N
S
5
0
10


MARCH
WIND SPEED
SOLID LINE Percent frequency of wind speed <11 knots
DASHED LINE Percent frequency of wind speed 11-21 knots
Wind speed and air temperature
Percent frequency of simultaneous occurrence of specified temperature °C and wind speed knots:
1% of all observations reported temperature 23°C simultaneously with wind speed of 22-33 kts
Indicates < 5% but > 0
Number of observations
WIND SPEED (KTS)
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10
1
2
3
4
70
80
90
20
10

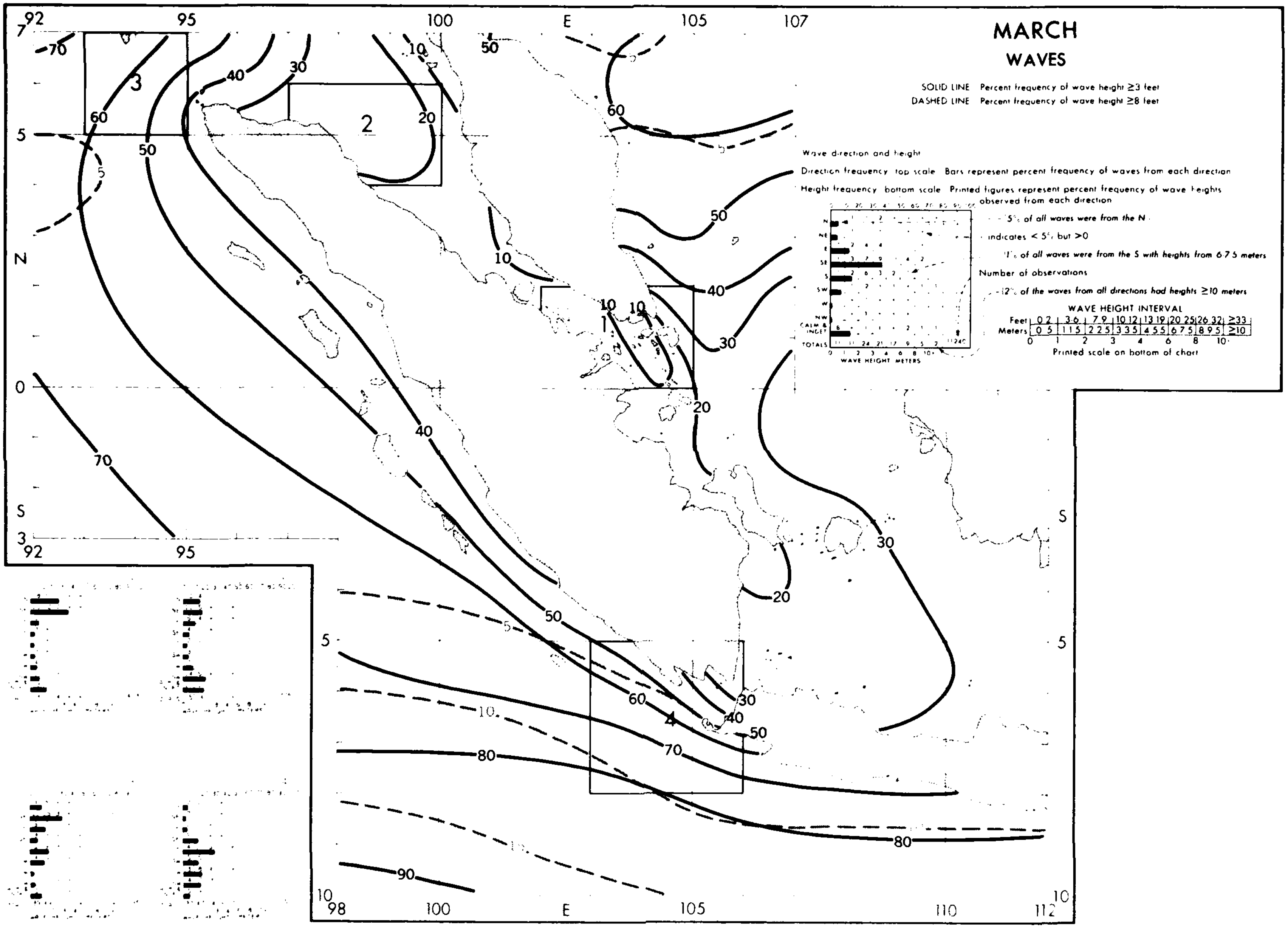

MARCH
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
E
100
105
7
5
N
0
S
1

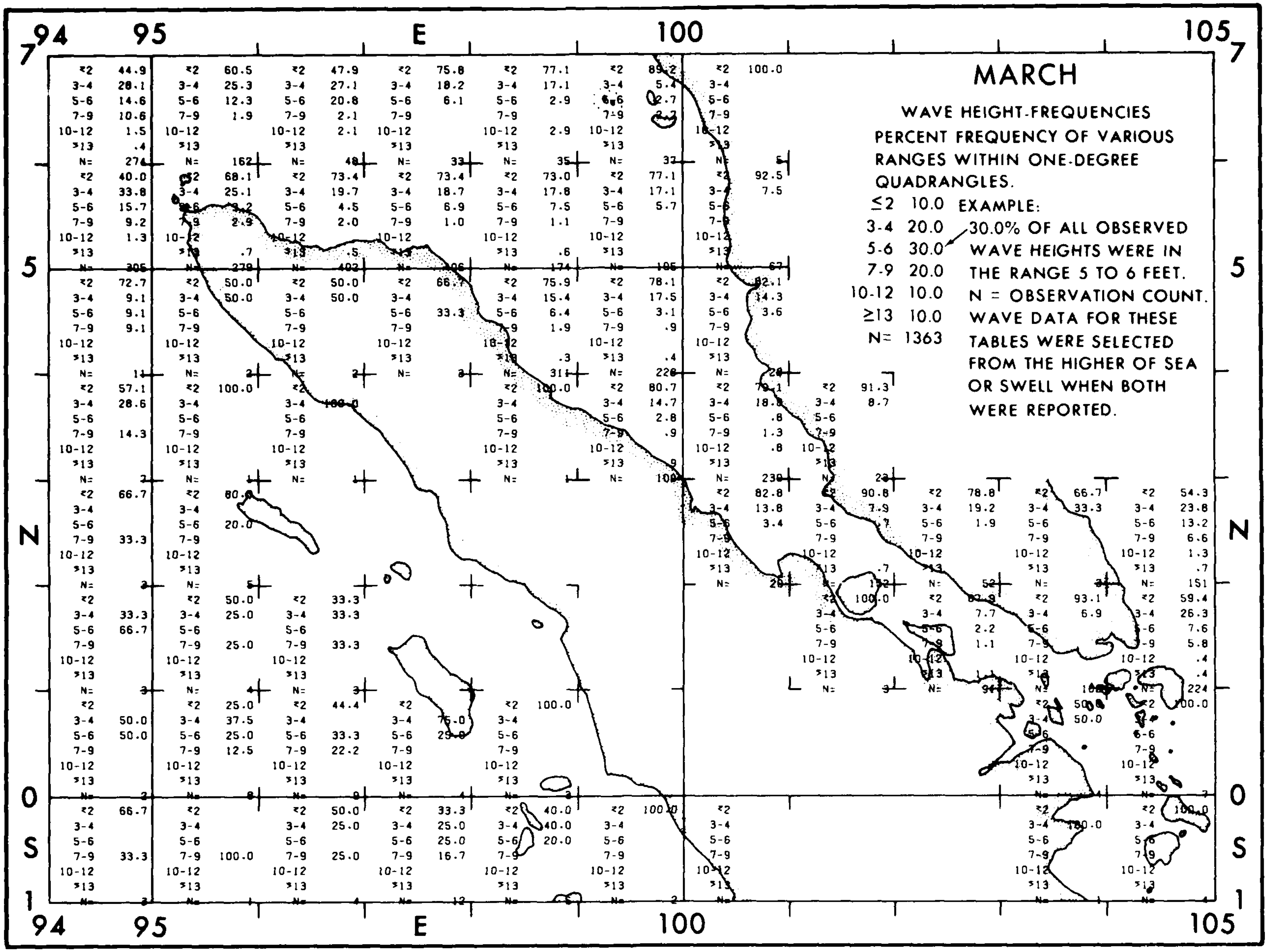

MARCH
SURFACE WIND ROSE
99
100
E
105
110
2
S
5
10

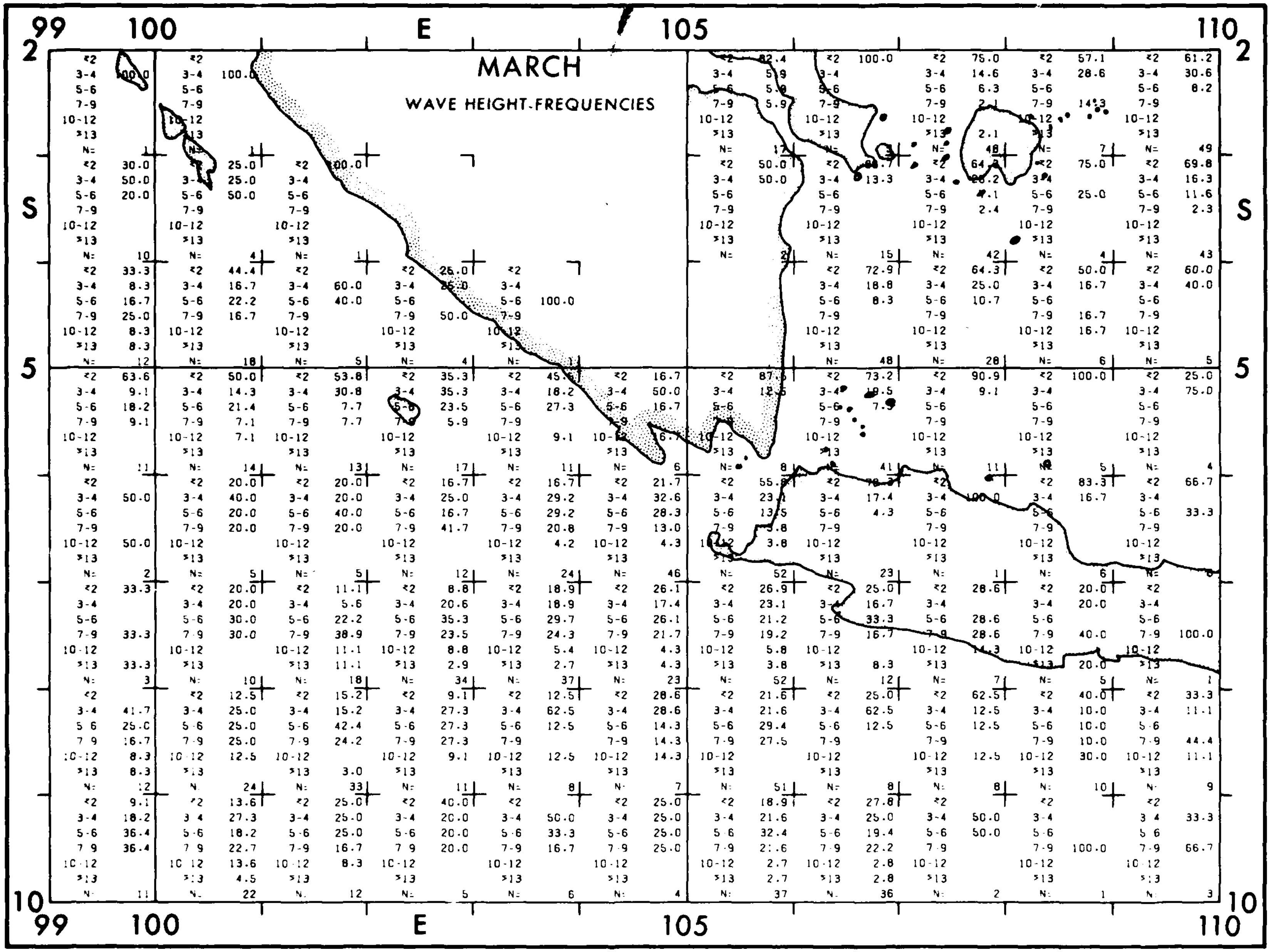


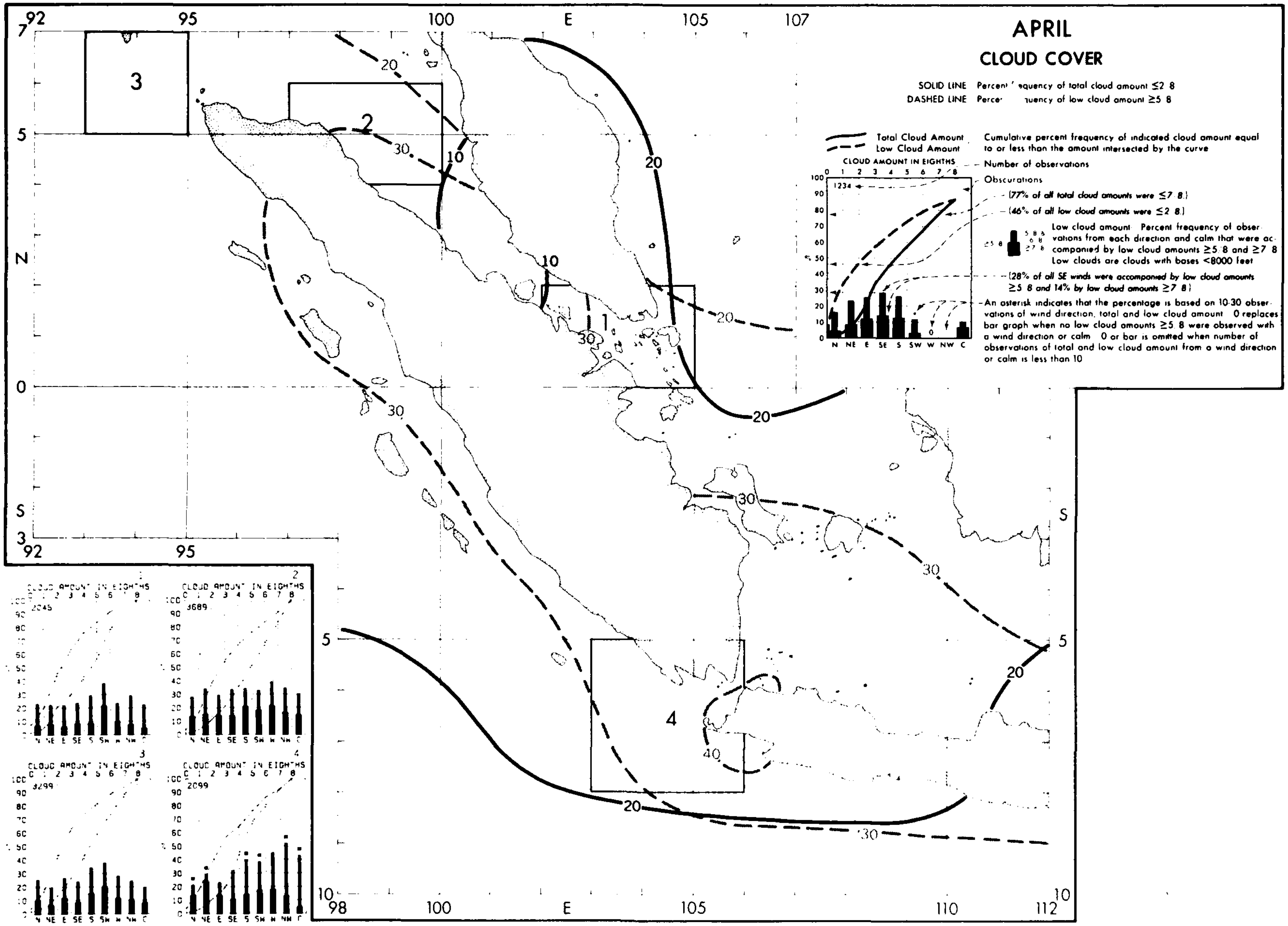
CONVERSION TABLE

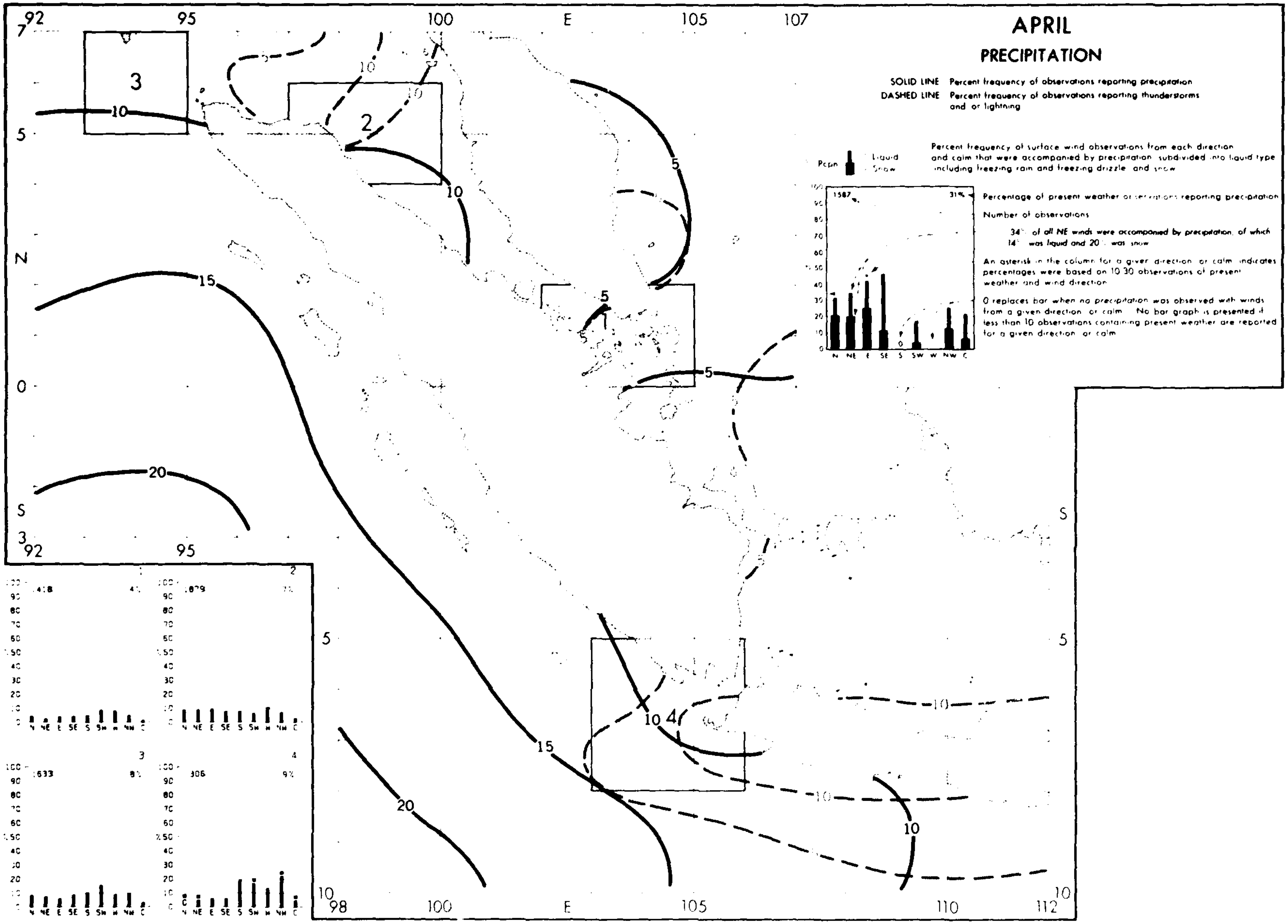
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2

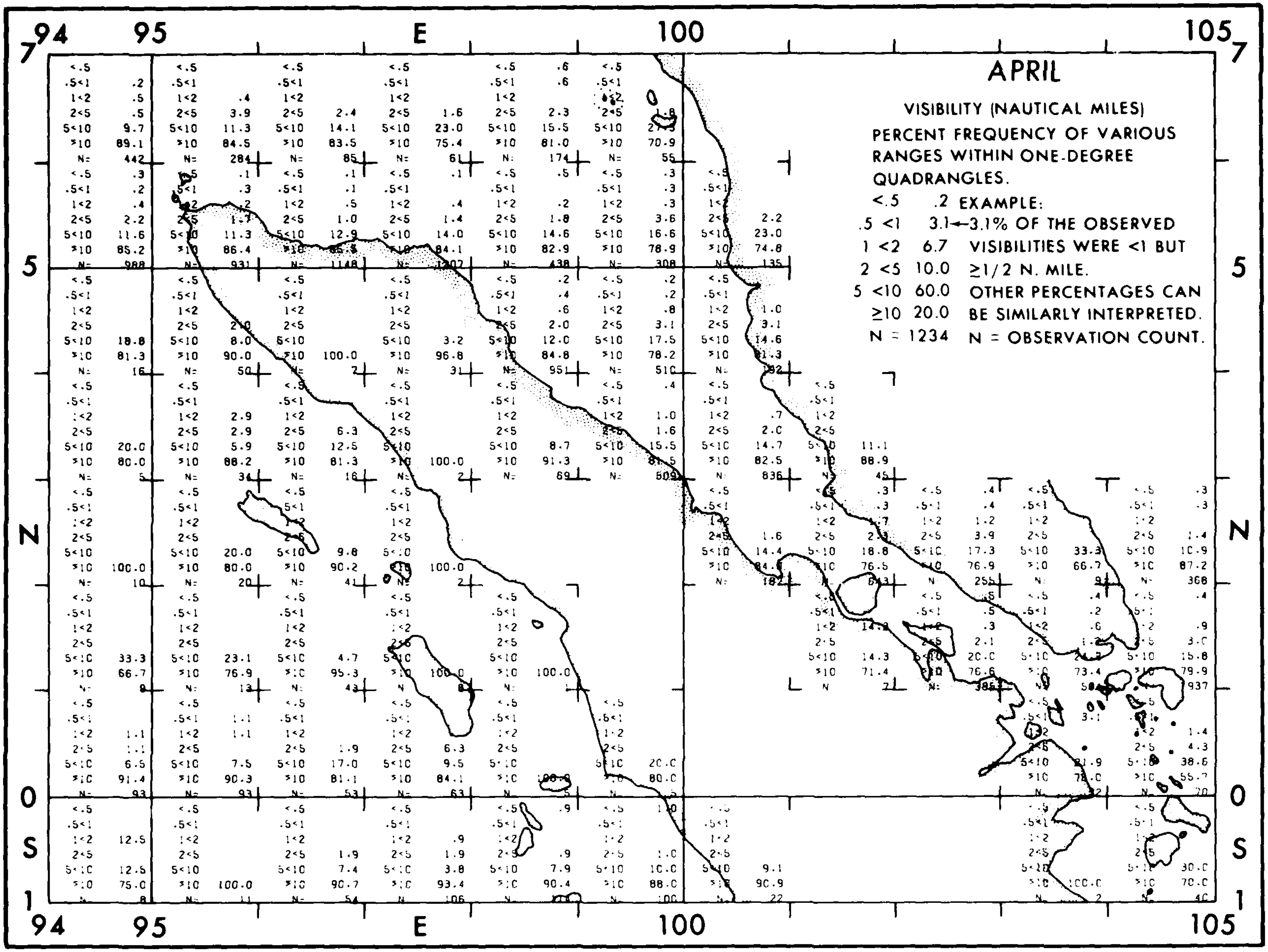

MARCH
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency top scale Bars represent percent frequency of waves from each direction
Height frequency bottom scale Printed figures represent percent frequency of wave heights observed from each direction
5% of all waves were from the N
indicates < 5% but >0
1% of all waves were from the S with heights from 6-7.5 meters
Number of observations
12% of the waves from all directions had heights ≥10 meters
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-4.5 6-7.5 8-9.5 ≥10
0 1 2 3 4 6 8 10
Printed scale on bottom of chart
WAVE HEIGHT METERS

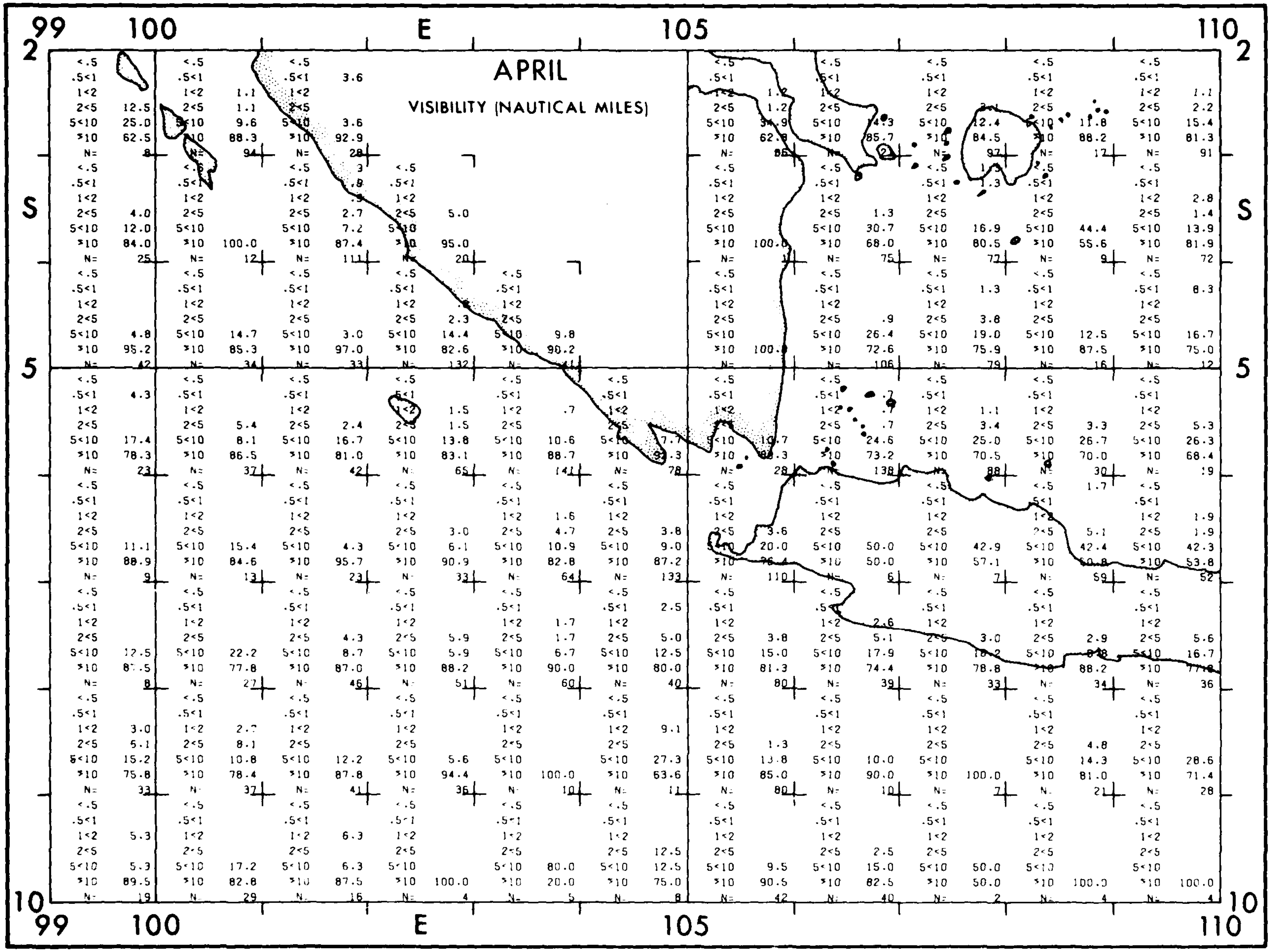

MARCH
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

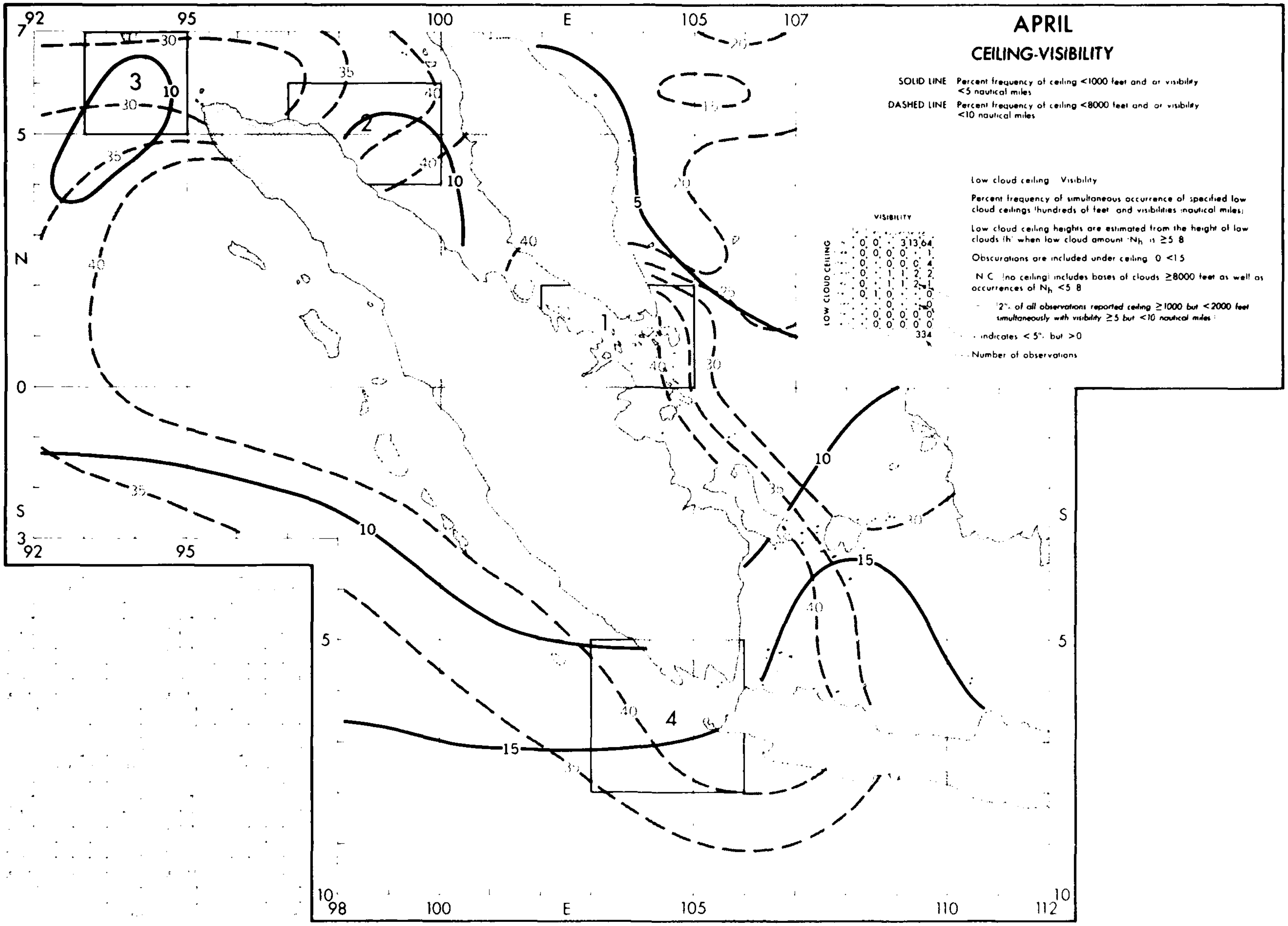

MARCH
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10

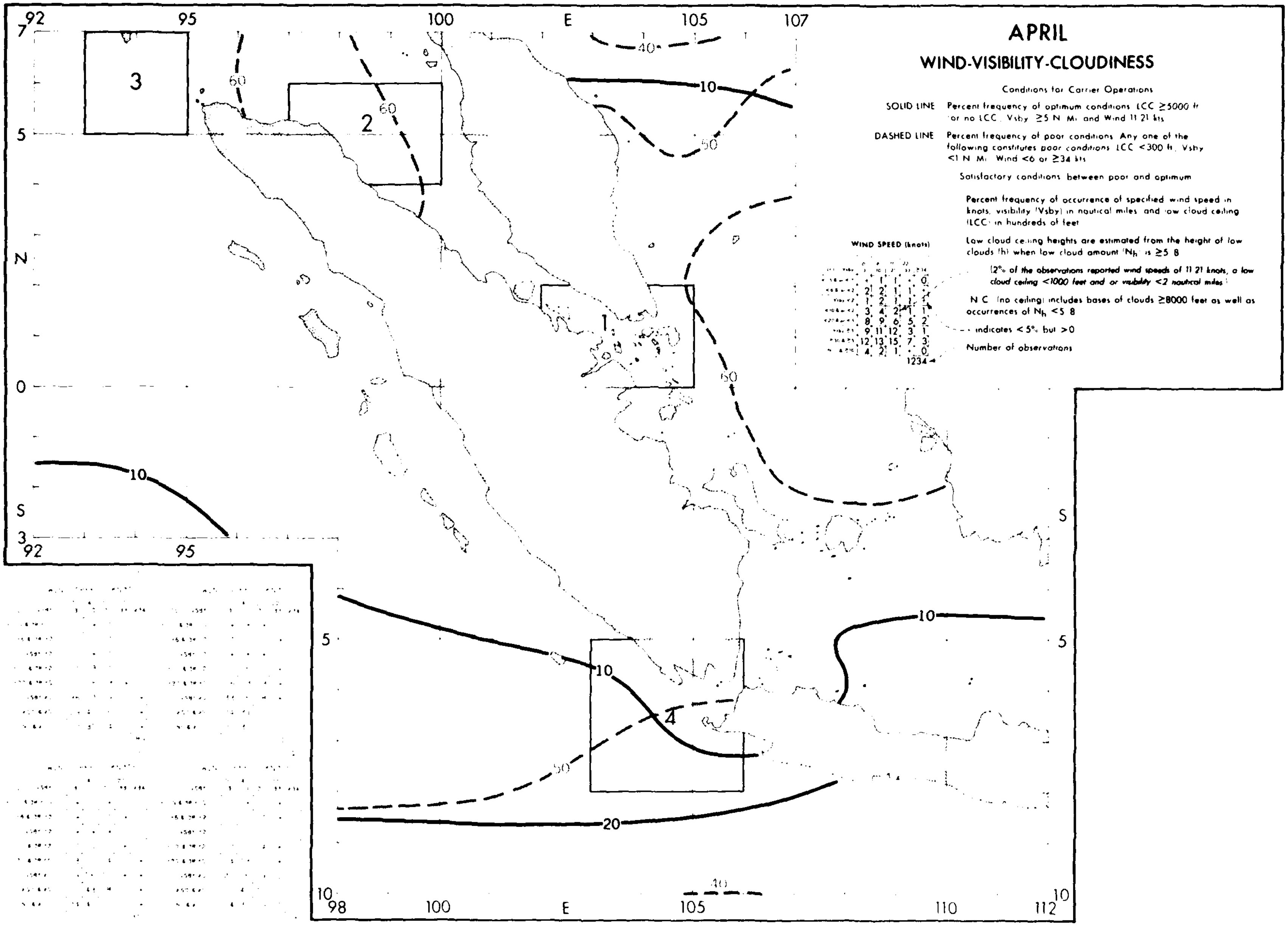

APRIL
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2 8
DASHED LINE Percent frequency of low cloud amount ≥5 8
Total Cloud Amount
Low Cloud Amount
CLOUD AMOUNT IN EIGHTHS
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7 8.)
(46% of all low cloud amounts were ≤2 8.)
Low cloud amount. Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5 8 and ≥7 8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5 8 and 14% by low cloud amounts ≥7 8.)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5 8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
CLOUD AMOUNT IN EIGHTHS

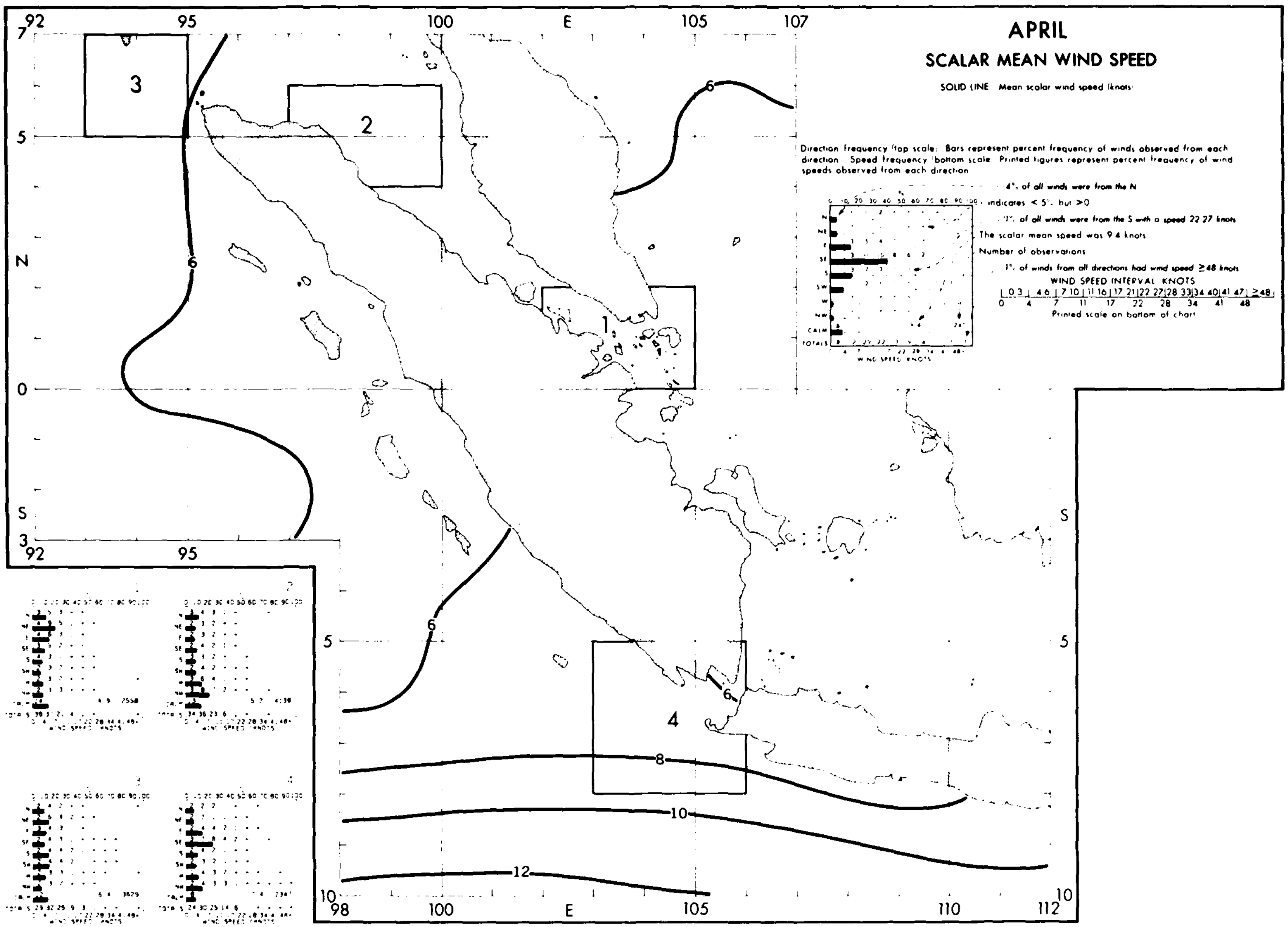

APRIL
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation subdivided into liquid type including freezing rain and freezing drizzle and snow
Pcpn
Liquid
Snow
Percentage of present weather observations reporting precipitation
Number of observations
34% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10-30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
92
95
100
E
105
107
110
112
98
N
S
0
5
10
15
20
1
2
3
4
N NE E SE S SW W NW C

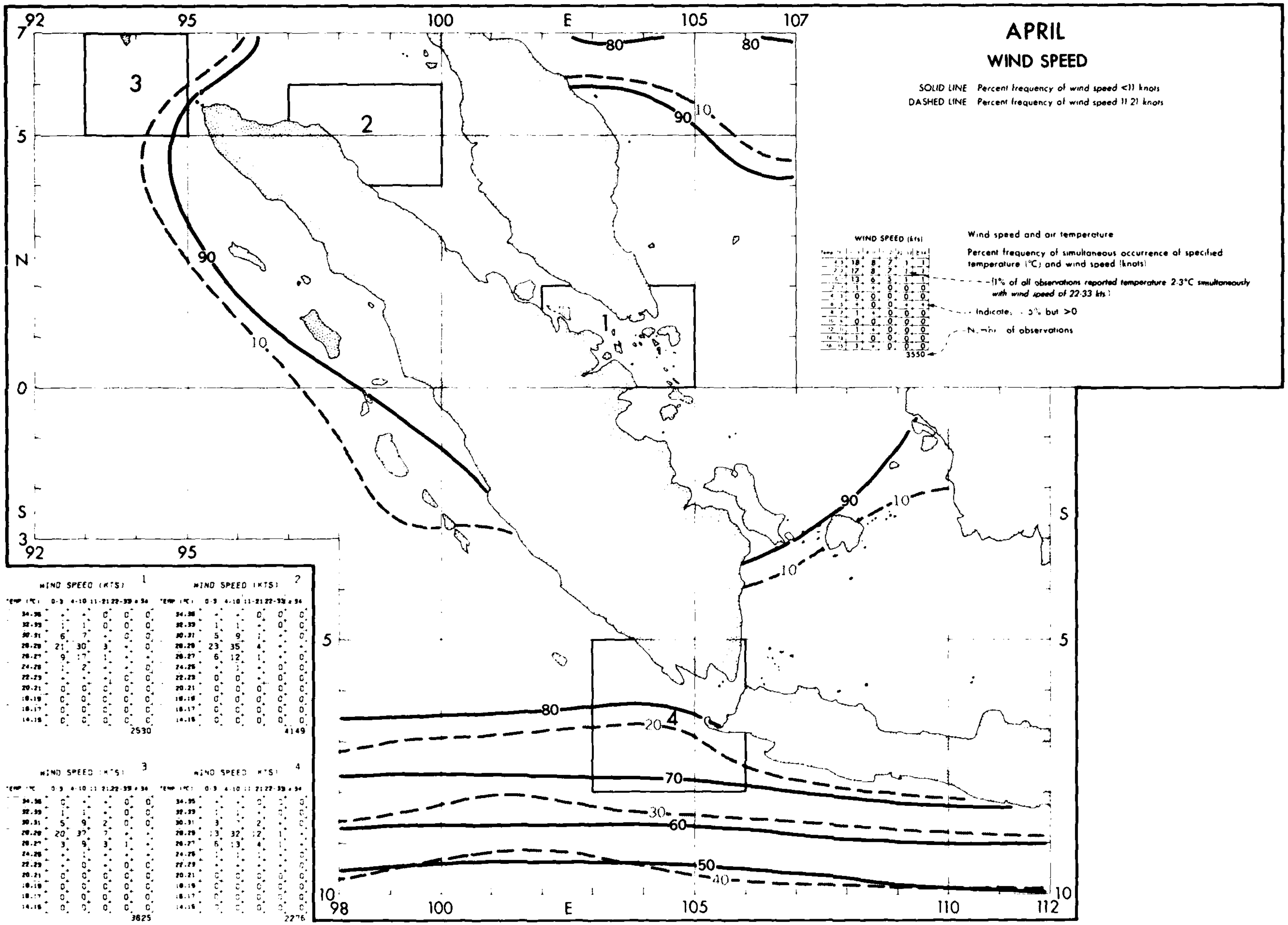

APRIL
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1


APRIL
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10


APRIL
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
Obscurations are included under ceiling 0 <1.5
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles)
indicates <5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
1
2
3
4
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10


APRIL
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft or no LCC, Vsby ≥5 N. Mi. and Wind 11-21 kts
DASHED LINE Percent frequency of poor conditions. Any one of the following constitutes poor conditions: LCC <300 ft, Vsby <1 N. Mi. Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5/8
12% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and/or visibility <2 nautical miles
N.C. (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5/8
· indicates <5% but >0
Number of observations
WIND SPEED (knots)
1234
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10
1
2
3
4
10
20
40
50
60


APRIL
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots)
Direction frequency (top scale): Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale): Printed figures represent percent frequency of wind speeds observed from each direction.
4% of all winds were from the N
indicates < 5% but > 0
1% of all winds were from the S with a speed 22-27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥ 48 knots
WIND SPEED INTERVAL KNOTS
0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 22-27 | 28-33 | 34-40 | 41-47 | ≥48
0 4 7 11 17 22 28 34 41 48
Printed scale on bottom of chart
WIND SPEED KNOTS
1
2
3
4
6
8
10
12
92
95
100
105
107
110
112
98
E
N
S
7
5
0
3
10



WIND SPEED (KTS) 1

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	•	•	0	0	0
32-33	1	1	0	0	0
30-31	6	7	•	0	0
28-29	21	30	3	•	0
26-27	9	17	1	•	•
24-25	1	2	•	•	0
22-23	•	•	•	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

2530

WIND SPEED (KTS) 2

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	•	•	0	0	0
32-33	1	1	•	0	0
30-31	5	9	1	•	0
28-29	23	35	4	•	•
26-27	6	12	1	•	0
24-25	•	1	•	0	0
22-23	0	0	•	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

4149

WIND SPEED (KTS) 3

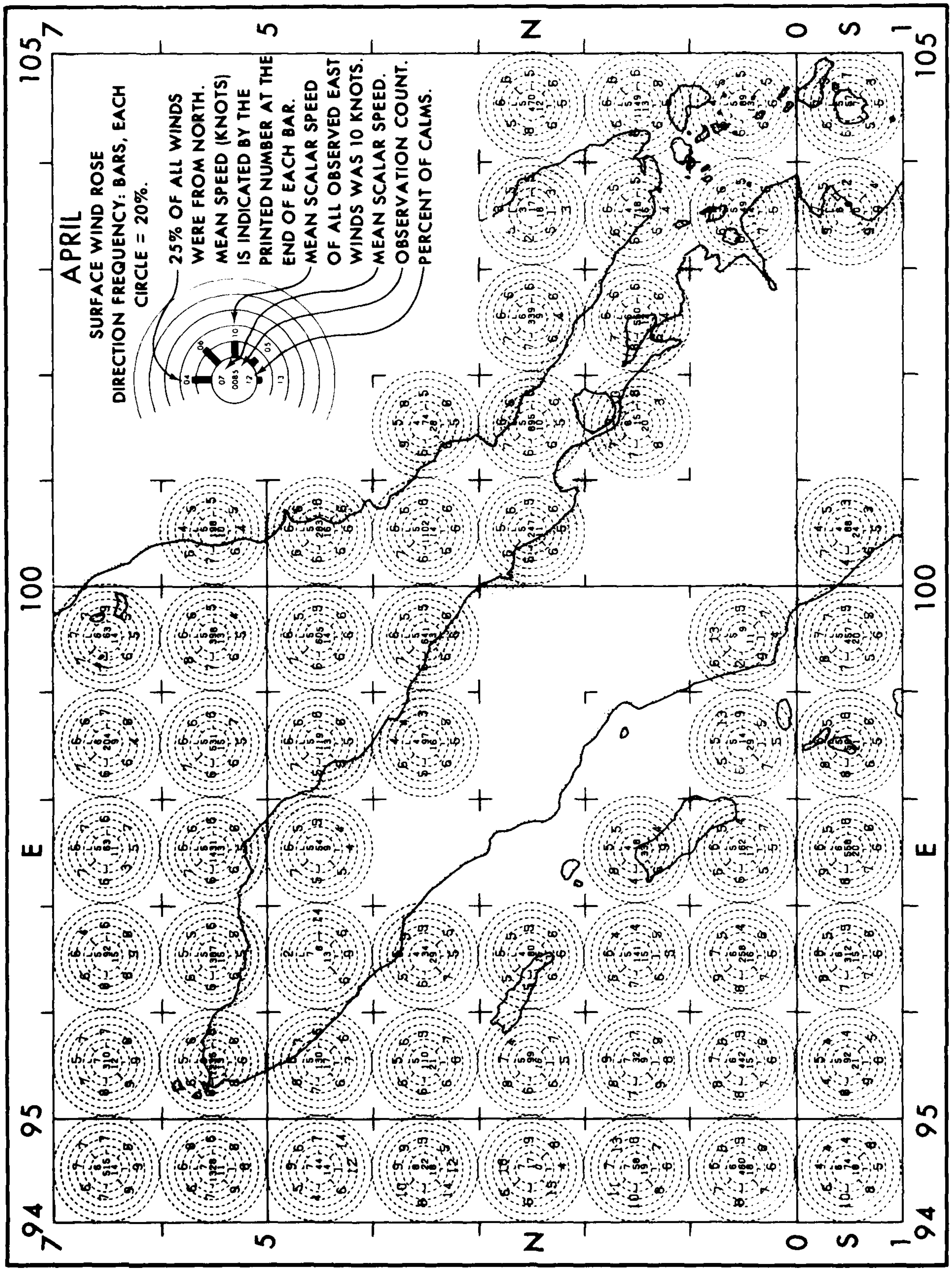
TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	0	•	•	0	0
32-33	1	1	•	0	0
30-31	5	9	2	0	0
28-29	20	37	7	•	•
26-27	3	9	3	1	•
24-25	•	1	•	•	•
22-23	•	0	•	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

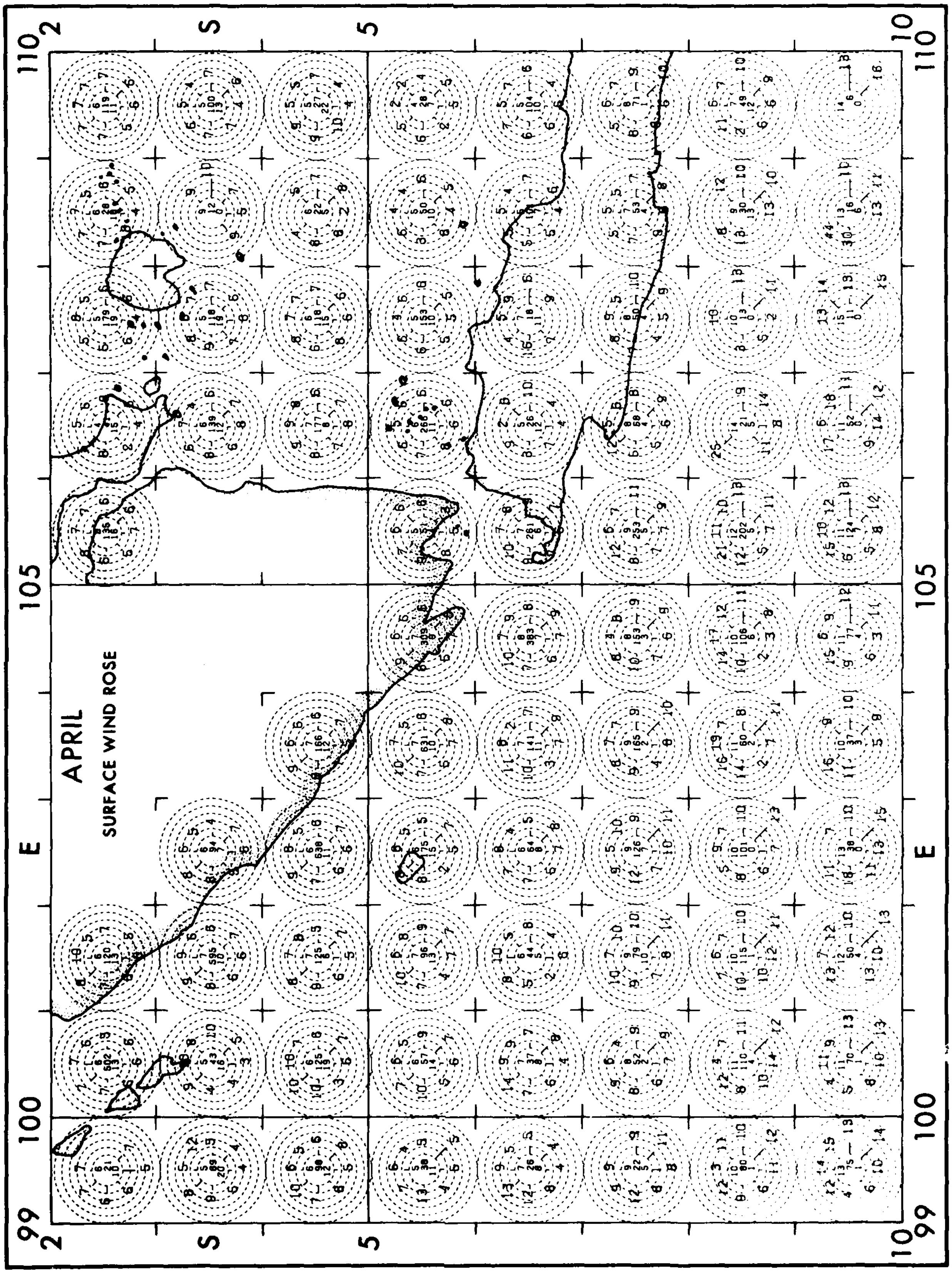
3825

WIND SPEED (KTS) 4

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	•	•	0	0	0
32-33	1	1	•	0	0
30-31	3	7	2	•	0
28-29	13	32	12	1	•
26-27	6	13	4	1	•
24-25	1	1	1	•	0
22-23	•	•	•	•	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

2276


APRIL
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
100
E
105
7
5
N
0
S
1

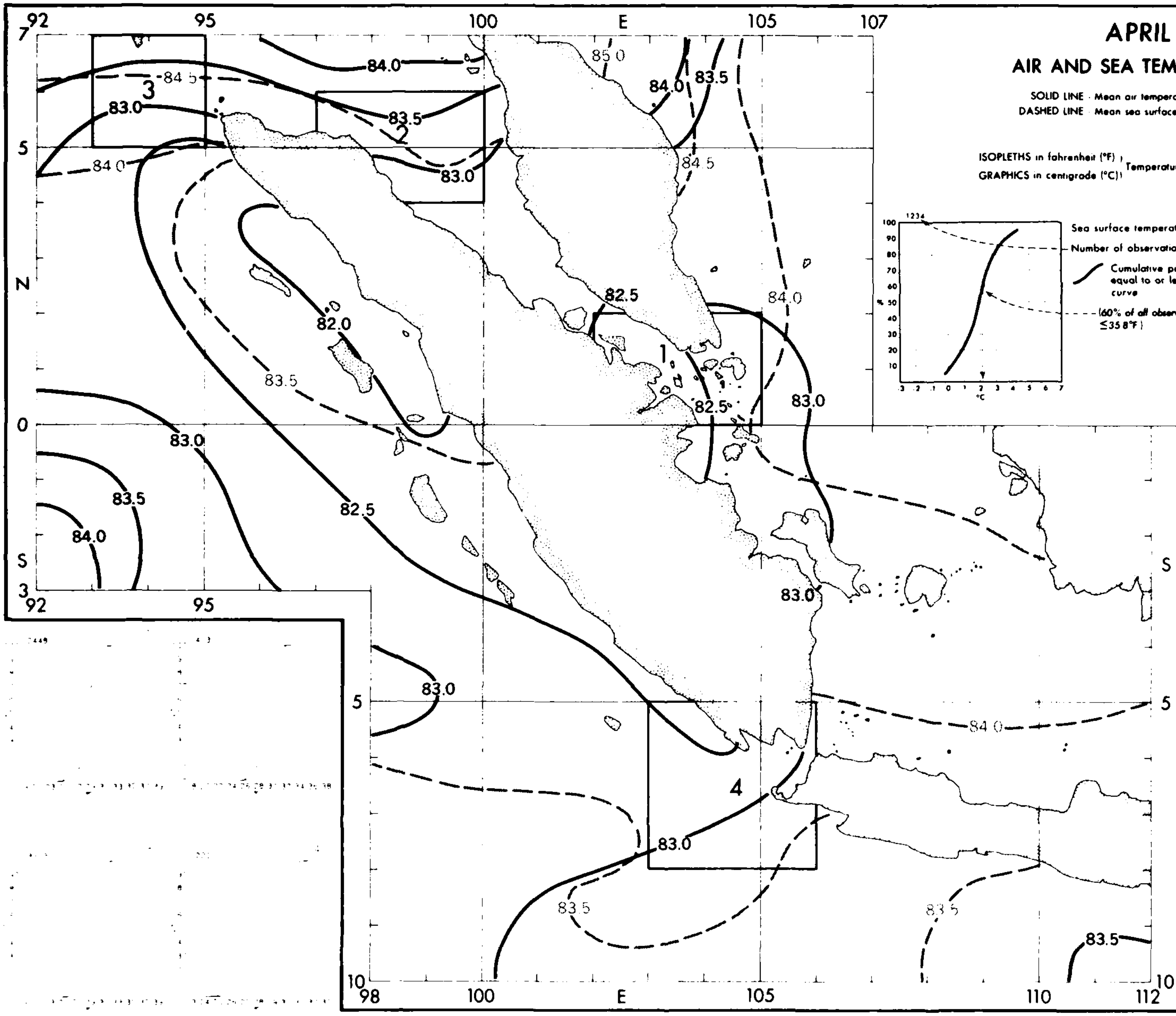

APRIL
SURFACE WIND ROSE
99
100
105
110
E
2
S
5
10

APRIL

AIR AND SEA TEMPERATURE

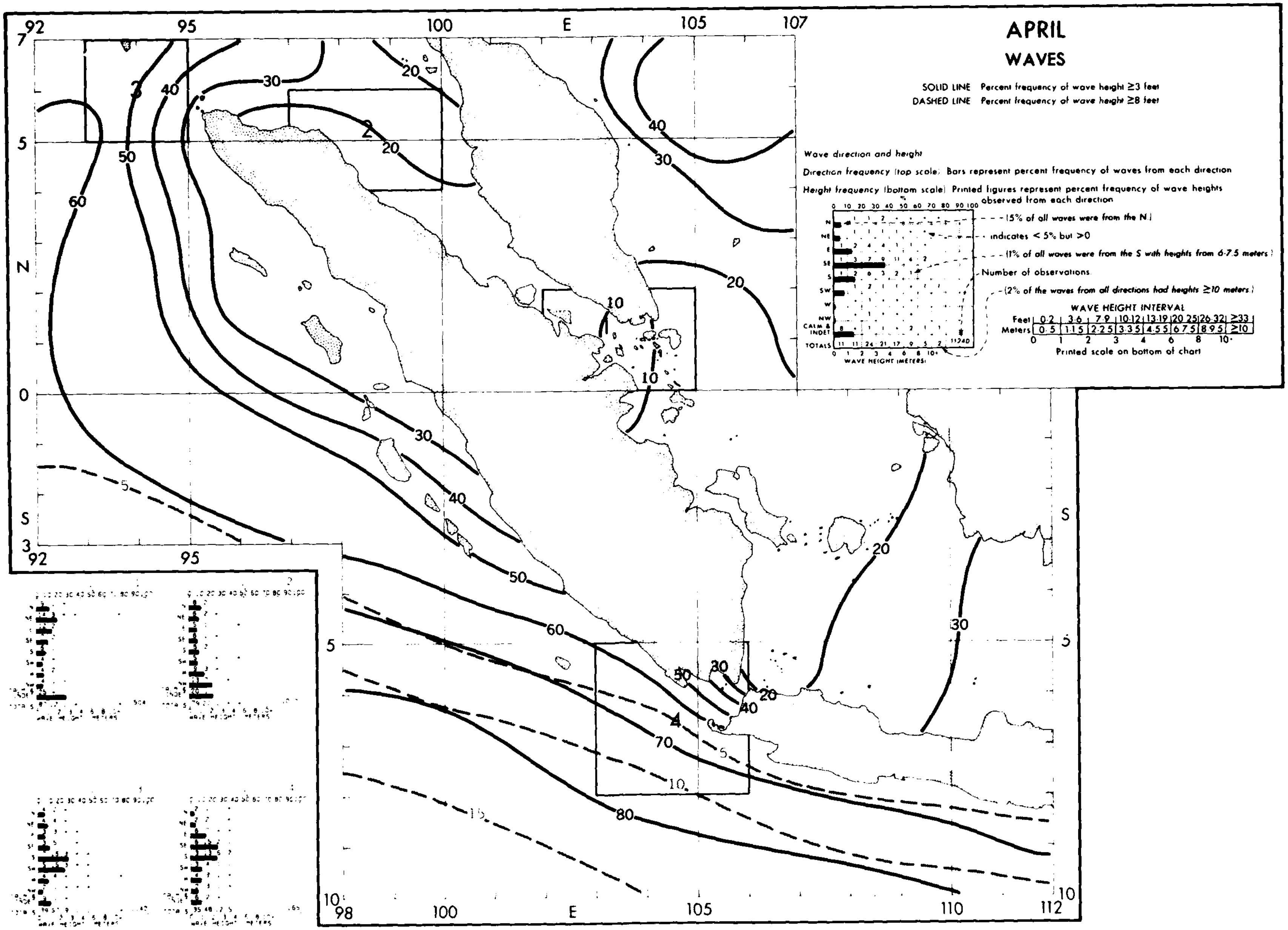
SOLID LINE · Mean air temperature (°F)
DASHED LINE · Mean sea surface temperature (°F)

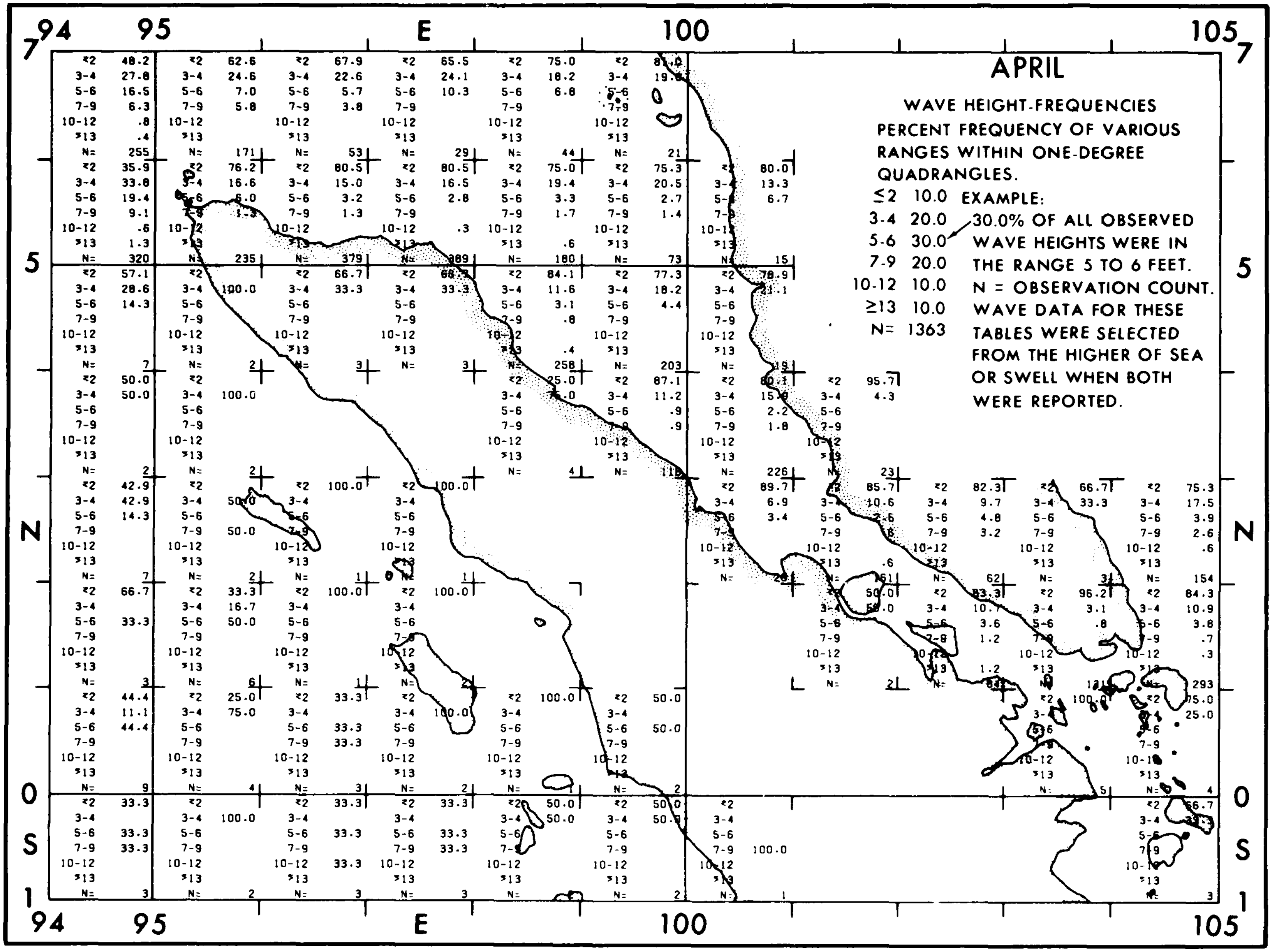
ISOPLETHS in fahrenheit (°F) } Temperature conversion table below
GRAPHICS in centigrade (°C) }

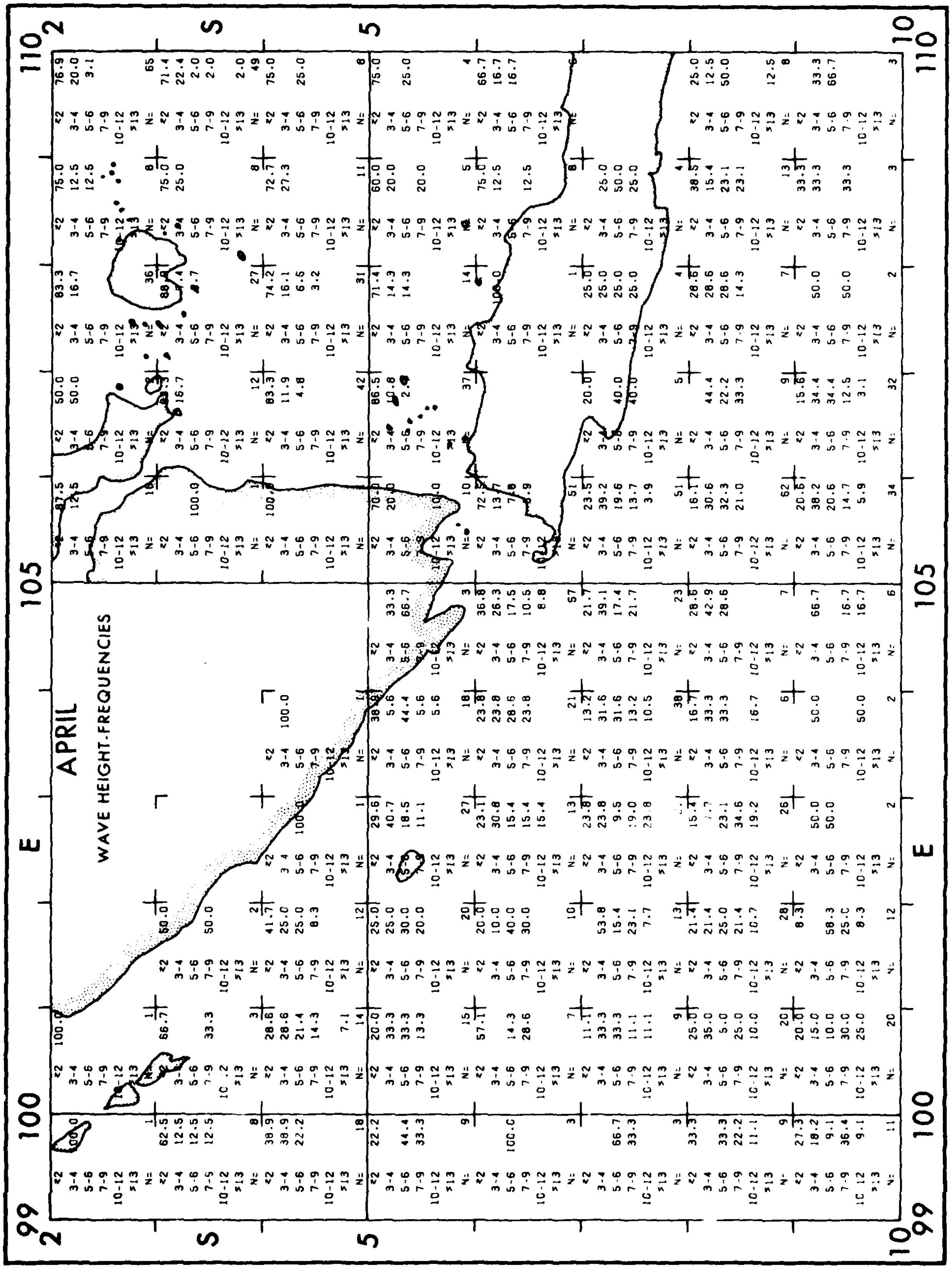


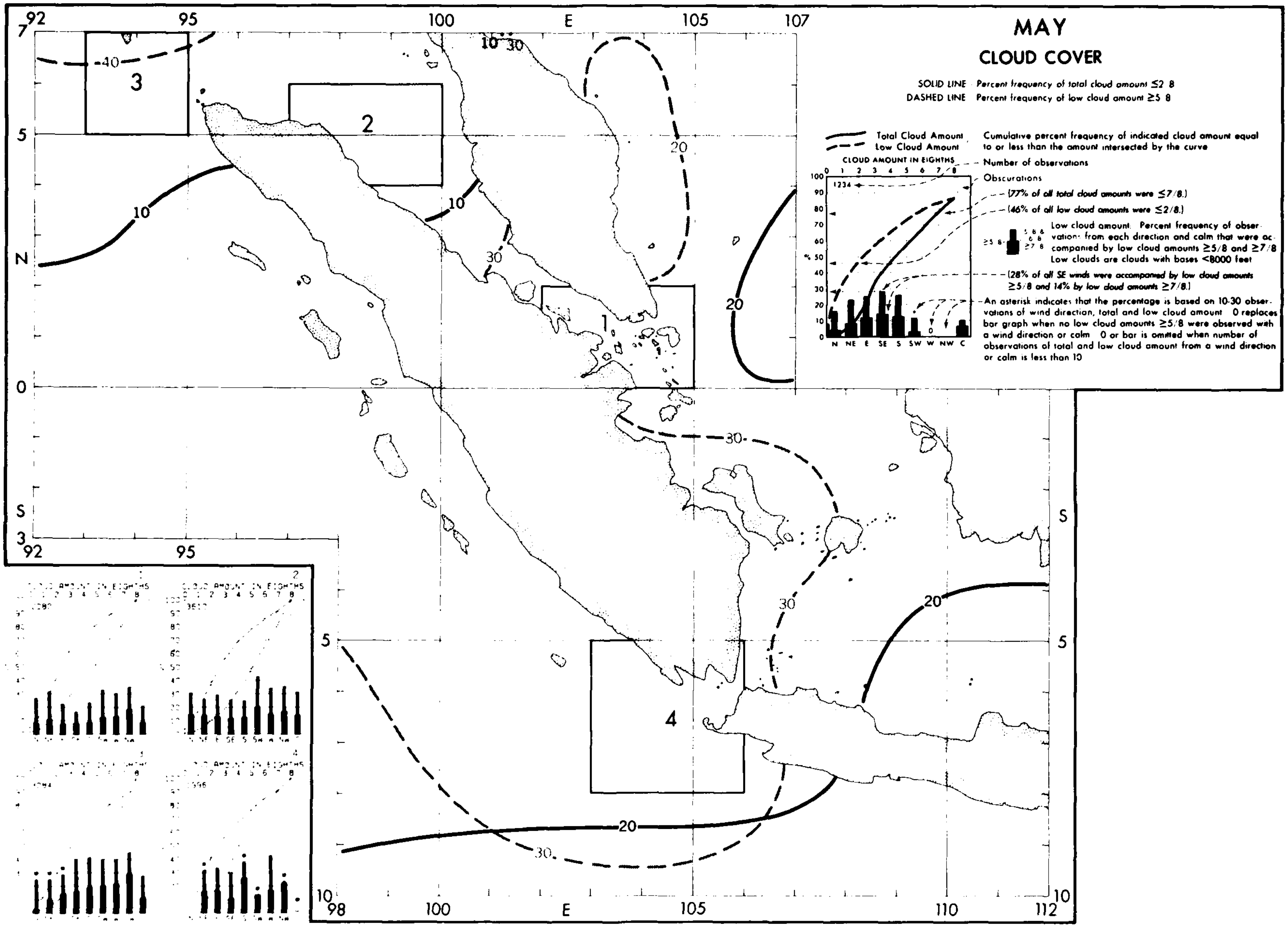
CONVERSION TABLE

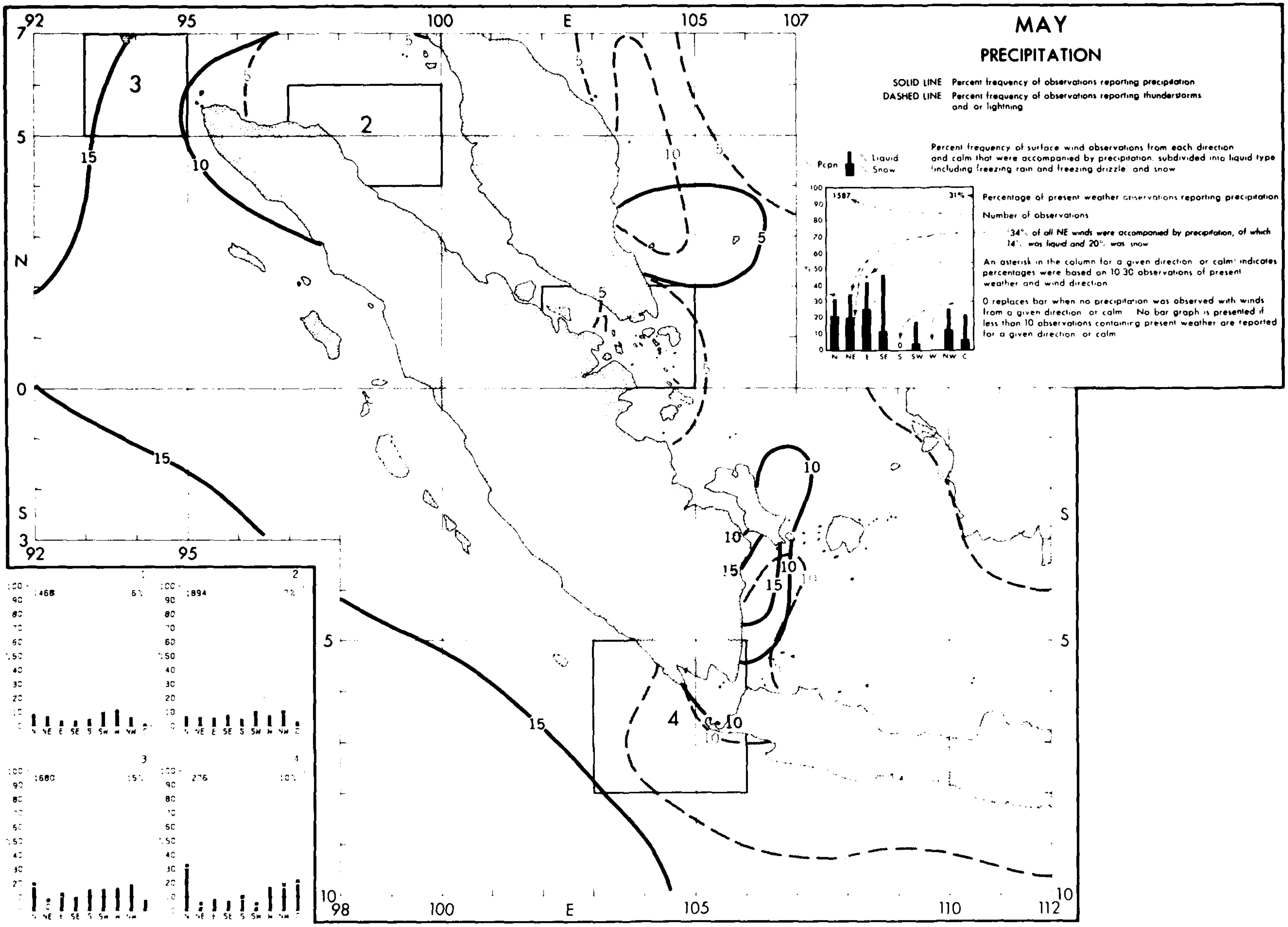
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2

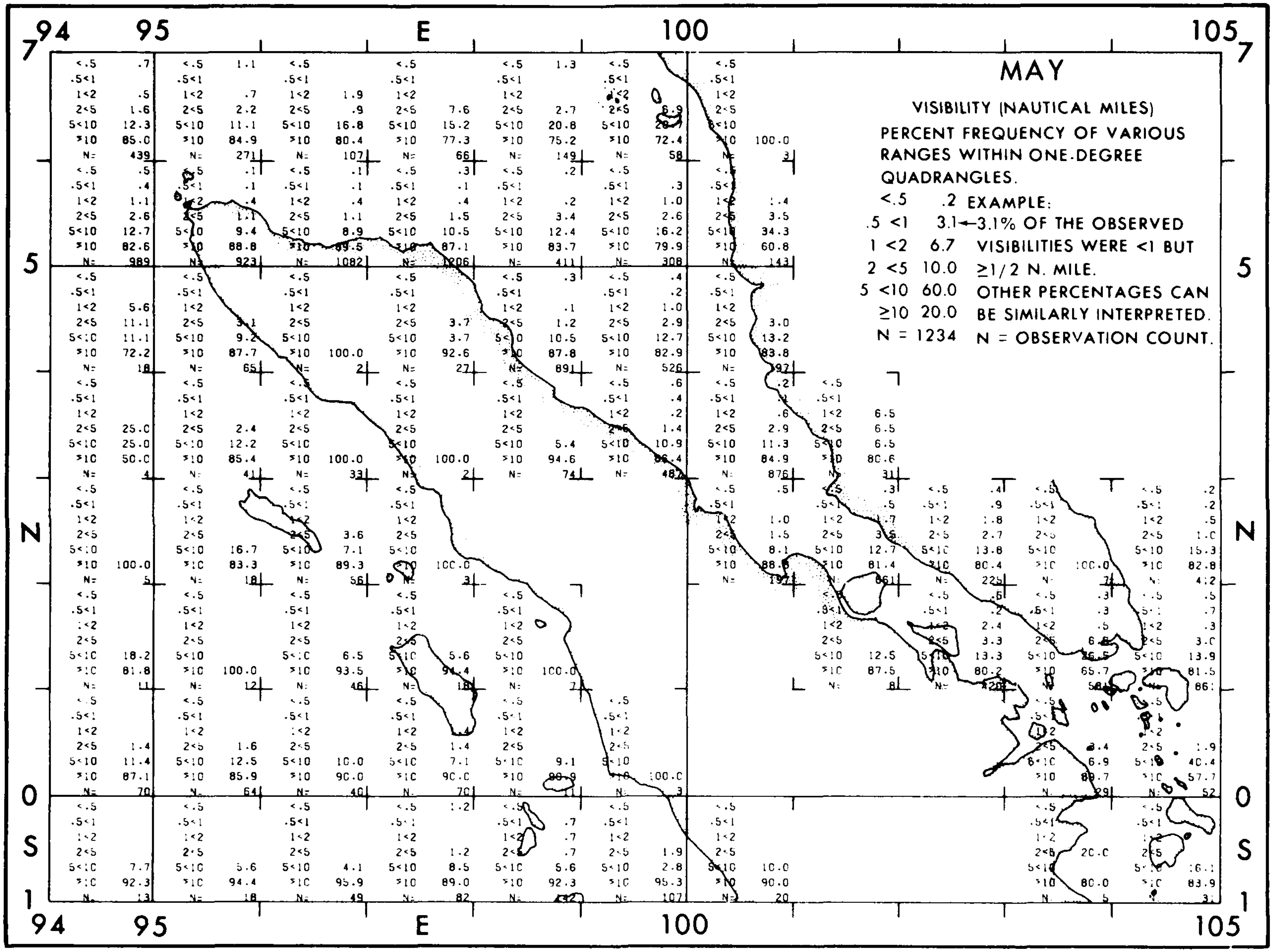

APRIL
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency (top scale): Bars represent percent frequency of waves from each direction
Height frequency (bottom scale): Printed figures represent percent frequency of wave heights observed from each direction
(15% of all waves were from the N.)
indicates < 5% but >0
(1% of all waves were from the S with heights from 6-7.5 meters.)
Number of observations
(2% of the waves from all directions had heights ≥10 meters.)
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-5.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
WAVE HEIGHT (METERS)
TOTALS
CALM & INDET
92
95
100
E
105
107
98
110
112
N
S
0
5
10


APRIL
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

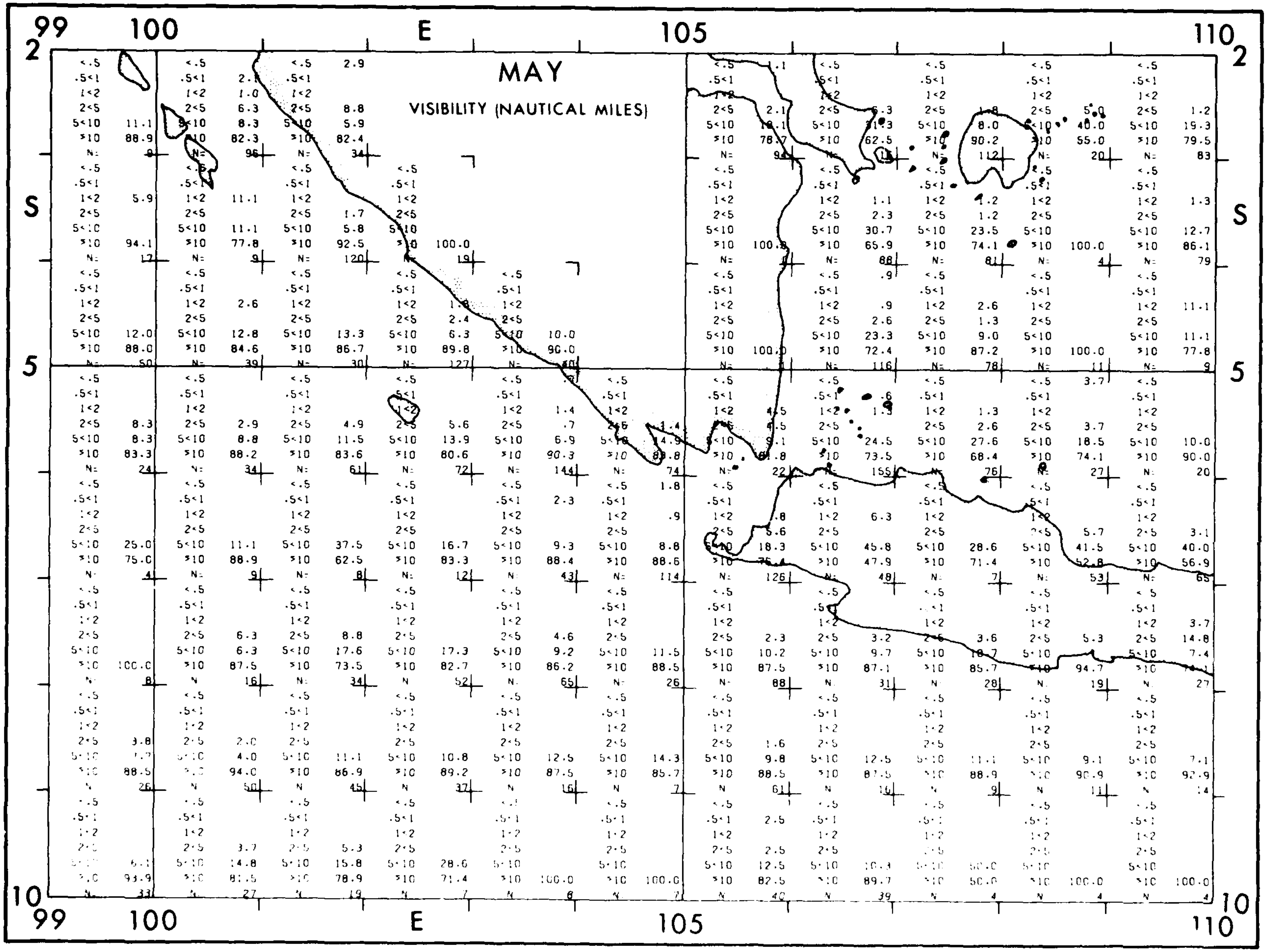

APRIL
WAVE HEIGHT-FREQUENCIES
99
100
105
110
E
S
5
2
10

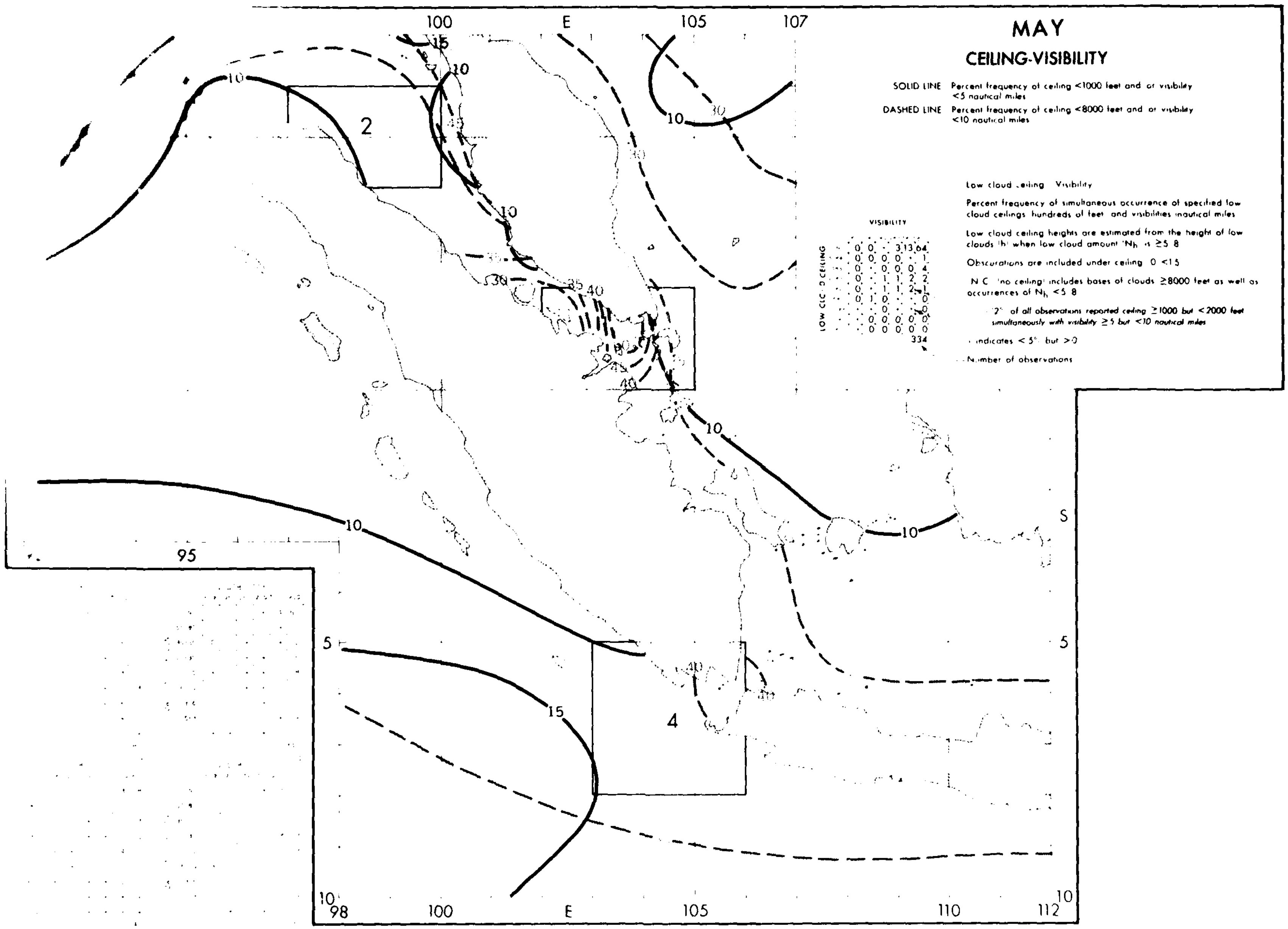

MAY
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2 8
DASHED LINE Percent frequency of low cloud amount ≥5 8
Total Cloud Amount
Low Cloud Amount
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
CLOUD AMOUNT IN EIGHTHS
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8.)
(46% of all low cloud amounts were ≤2/8.)
Low cloud amount. Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8.)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
N NE E SE S SW W NW C
1234
1
2
3
4
10
20
30
40
N
E
S
0
5
7
10
92
95
98
100
105
107
110
112

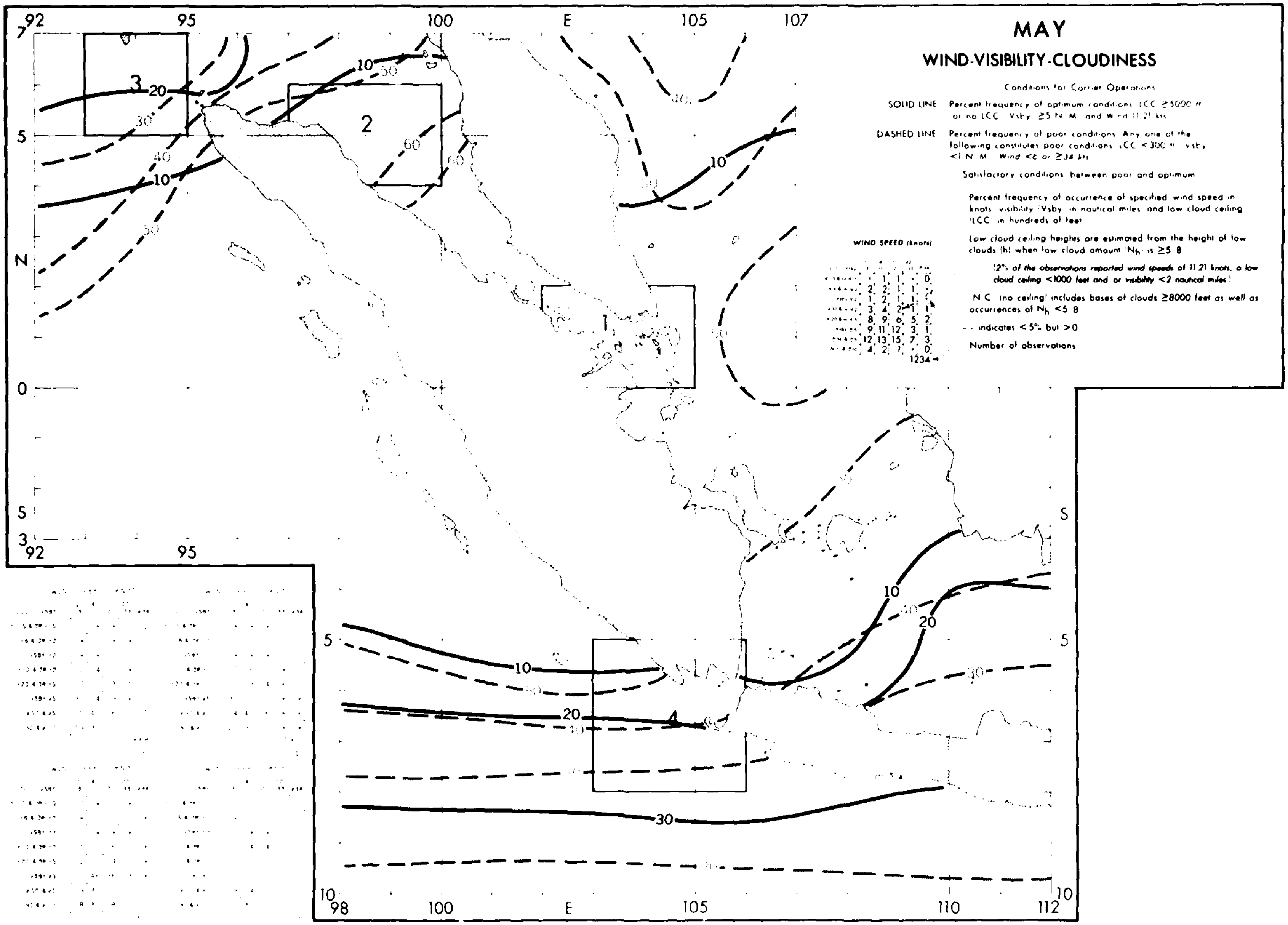

MAY
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Pcpn
Liquid
Snow
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation, subdivided into liquid type (including freezing rain and freezing drizzle) and snow
Percentage of present weather observations reporting precipitation
Number of observations
34% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction (or calm) indicates percentages were based on 10-30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
1587
31%
N NE E SE S SW W NW C
1468
6%
1894
7%
1680
15%
276
10%
92
95
100
105
107
110
112
98
E
N
S
0
3
5
7
10
15
1
2
3
4

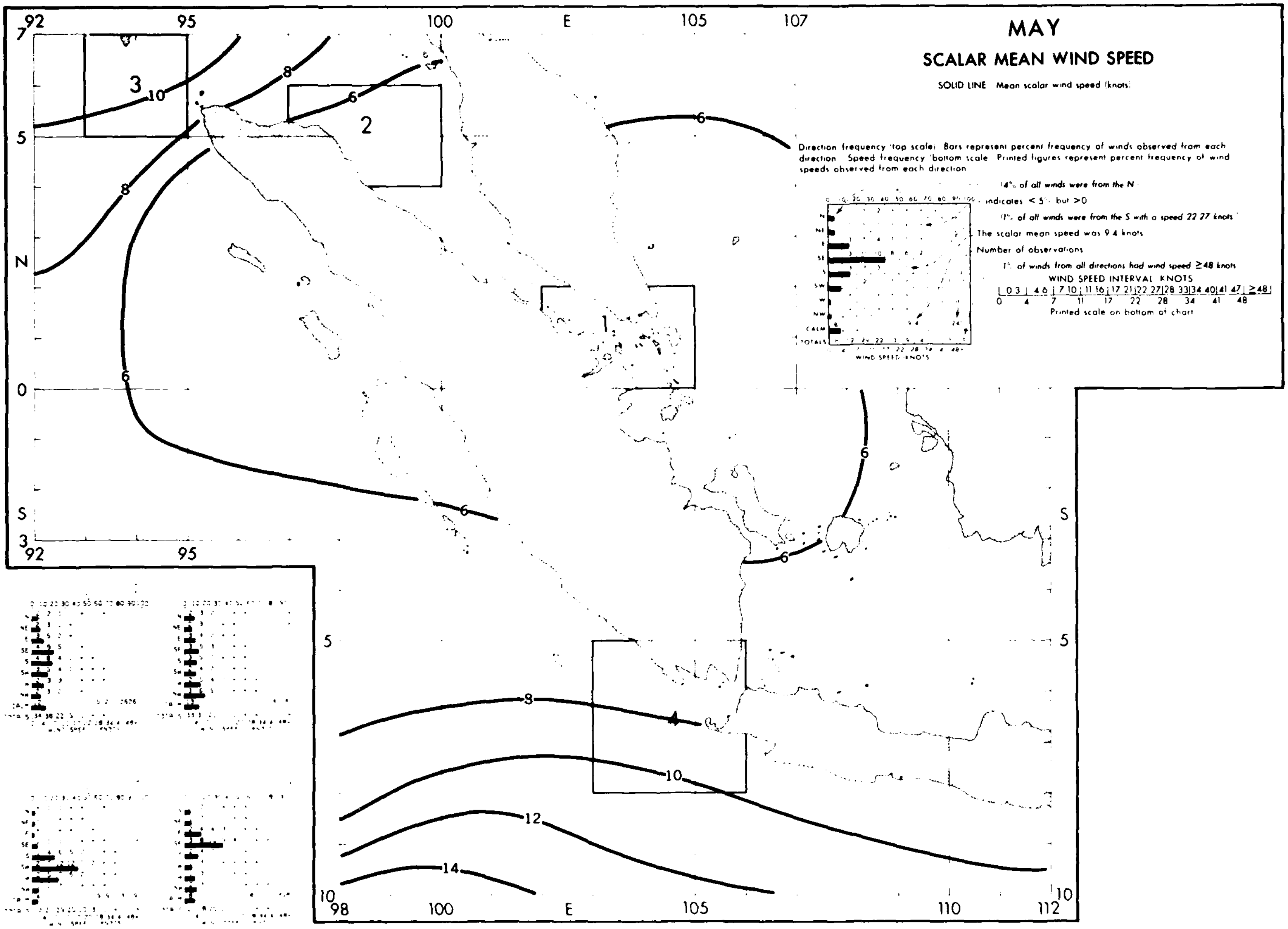


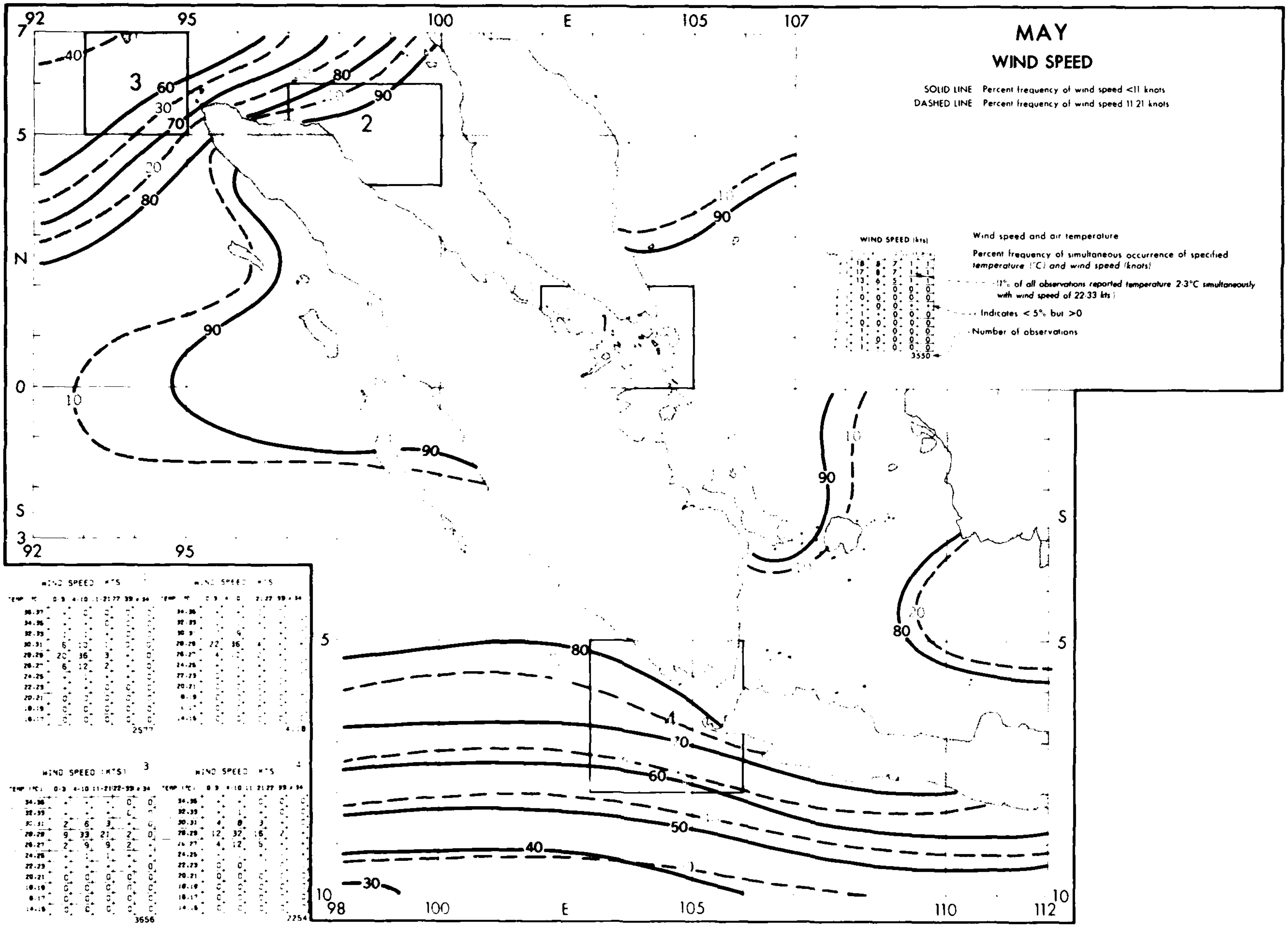
MAY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1

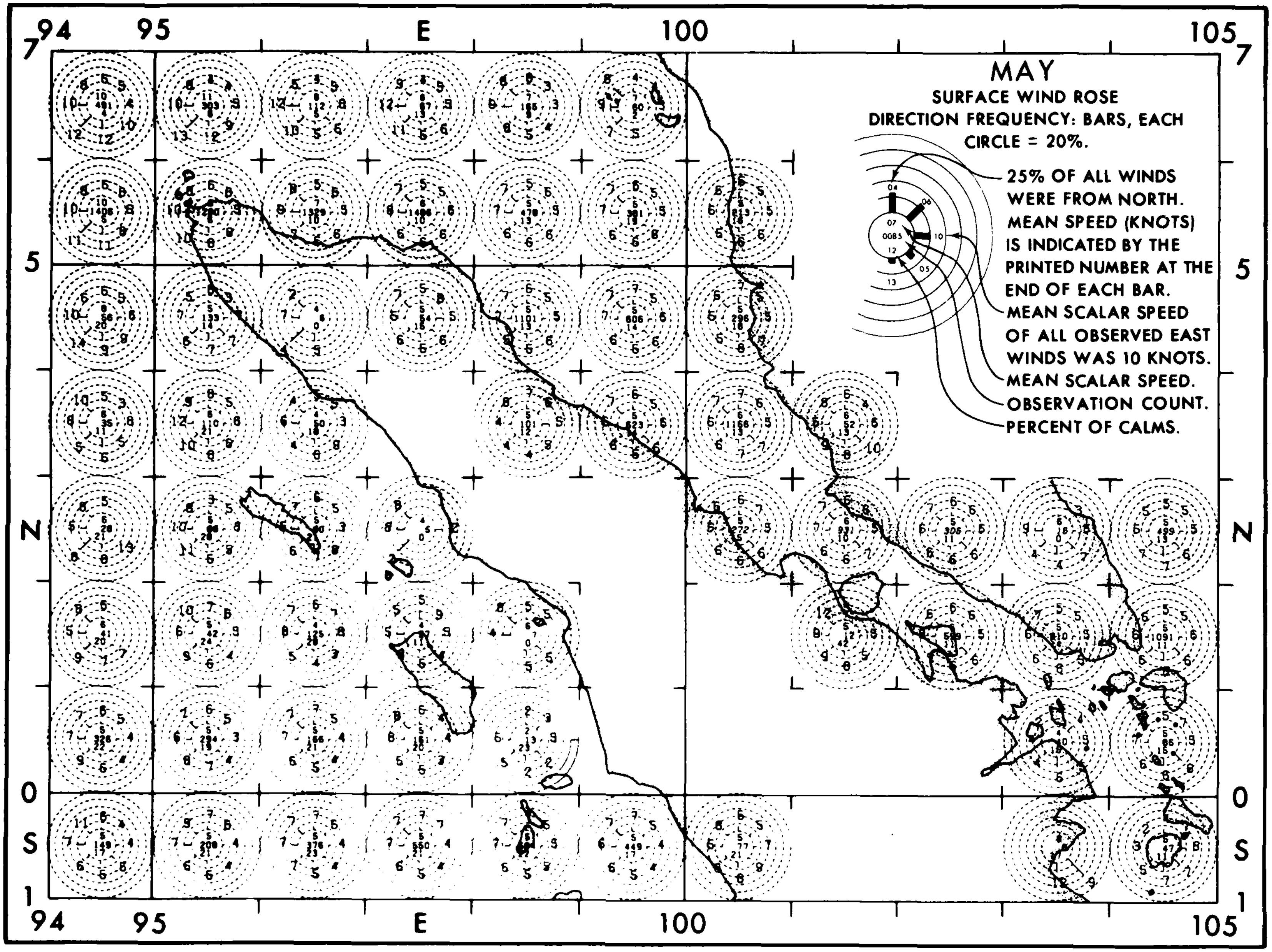

MAY
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10

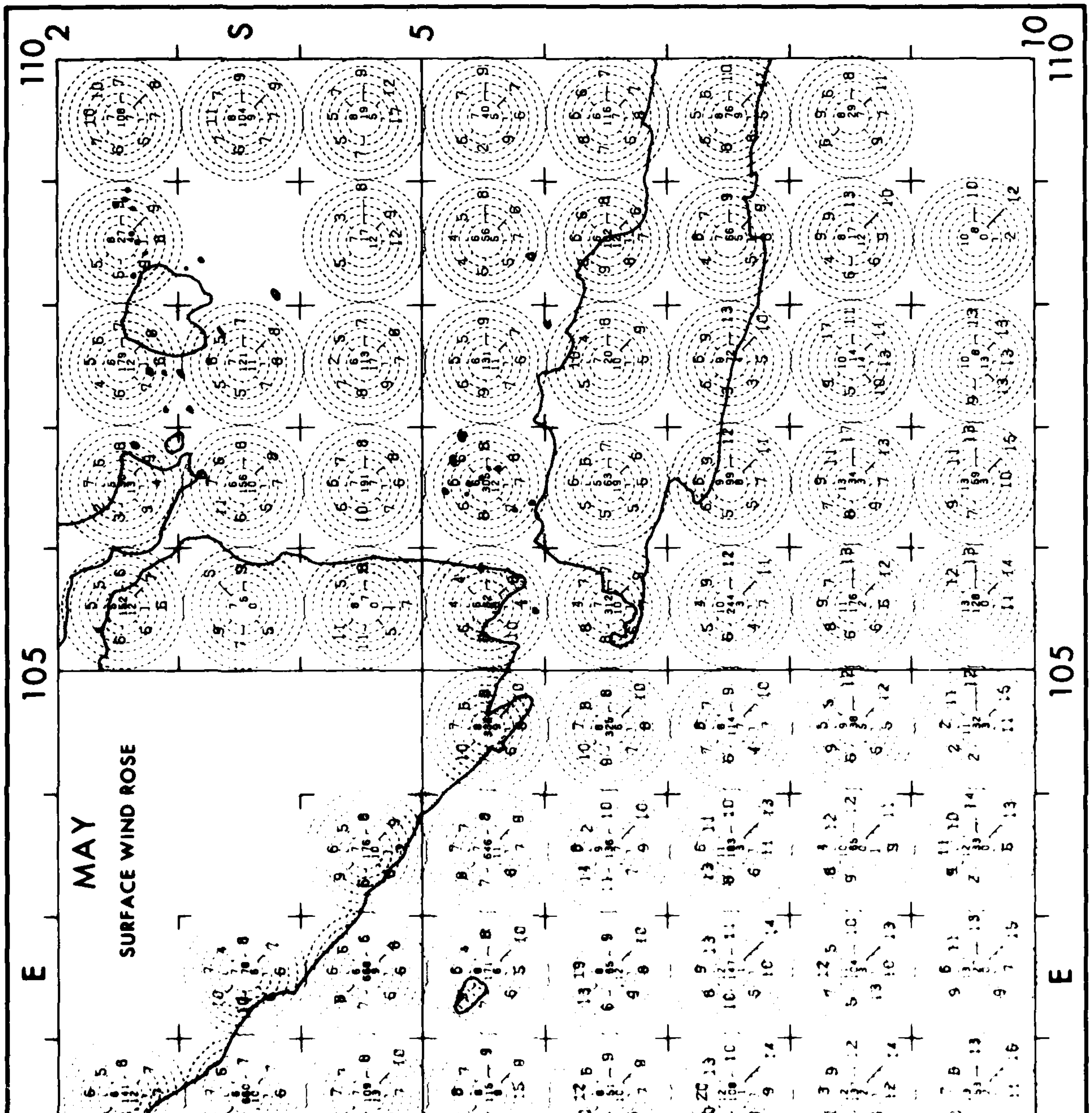

MAY
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings hundreds of feet and visibilities nautical miles
Low cloud ceiling heights are estimated from the height of low clouds when low cloud amount Nh is ≥5 8
Obscurations are included under ceiling 0 <1.5
N C no ceiling includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles
indicates <5 but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
2
4
95
98
100
105
107
110
112
E
S
5
10
15
30
35
40

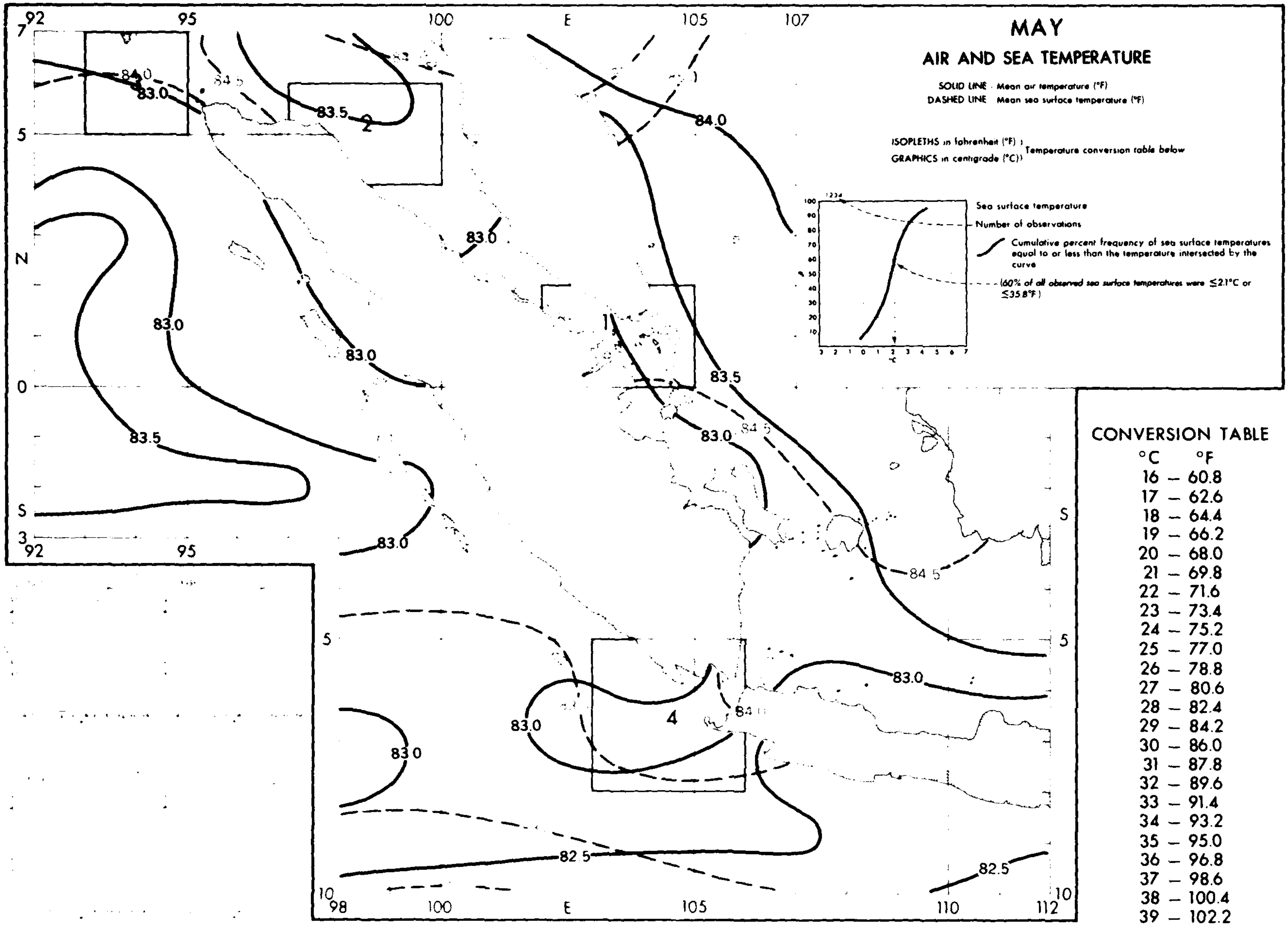

MAY
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft or no LCC Vsby ≥5 N M and Wind 11 21 kts
DASHED LINE Percent frequency of poor conditions Any one of the following constitutes poor conditions LCC <300 ft vsby <1 N M Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots visibility (Vsby) in nautical miles and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
(2% of the observations reported wind speeds of 11 21 knots, a low cloud ceiling <1000 feet and or visibility <2 nautical miles)
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
indicates <5% but >0
Number of observations
WIND SPEED (knots)
1234
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10
1
2
3
4
10
20
30
40
50
60


MAY
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots)
Direction frequency (top scale) Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale) Printed figures represent percent frequency of wind speeds observed from each direction
14% of all winds were from the N
indicates < 5% but > 0
1% of all winds were from the S with a speed 22-27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥48 knots
WIND SPEED INTERVAL KNOTS
0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 22-27 | 28-33 | 34-40 | 41-47 | ≥48
0 4 7 11 17 22 28 34 41 48
Printed scale on bottom of chart
WIND SPEED KNOTS
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10
1
2
3
4
6
8
10
12
14


MAY
WIND SPEED
SOLID LINE Percent frequency of wind speed <11 knots
DASHED LINE Percent frequency of wind speed 11-21 knots
Wind speed and air temperature
Percent frequency of simultaneous occurrence of specified temperature (°C) and wind speed (knots)
Indicates < 5% but >0
Number of observations
WIND SPEED (kts)
92
95
100
E
105
107
110
112
98
N
S
0
5
10

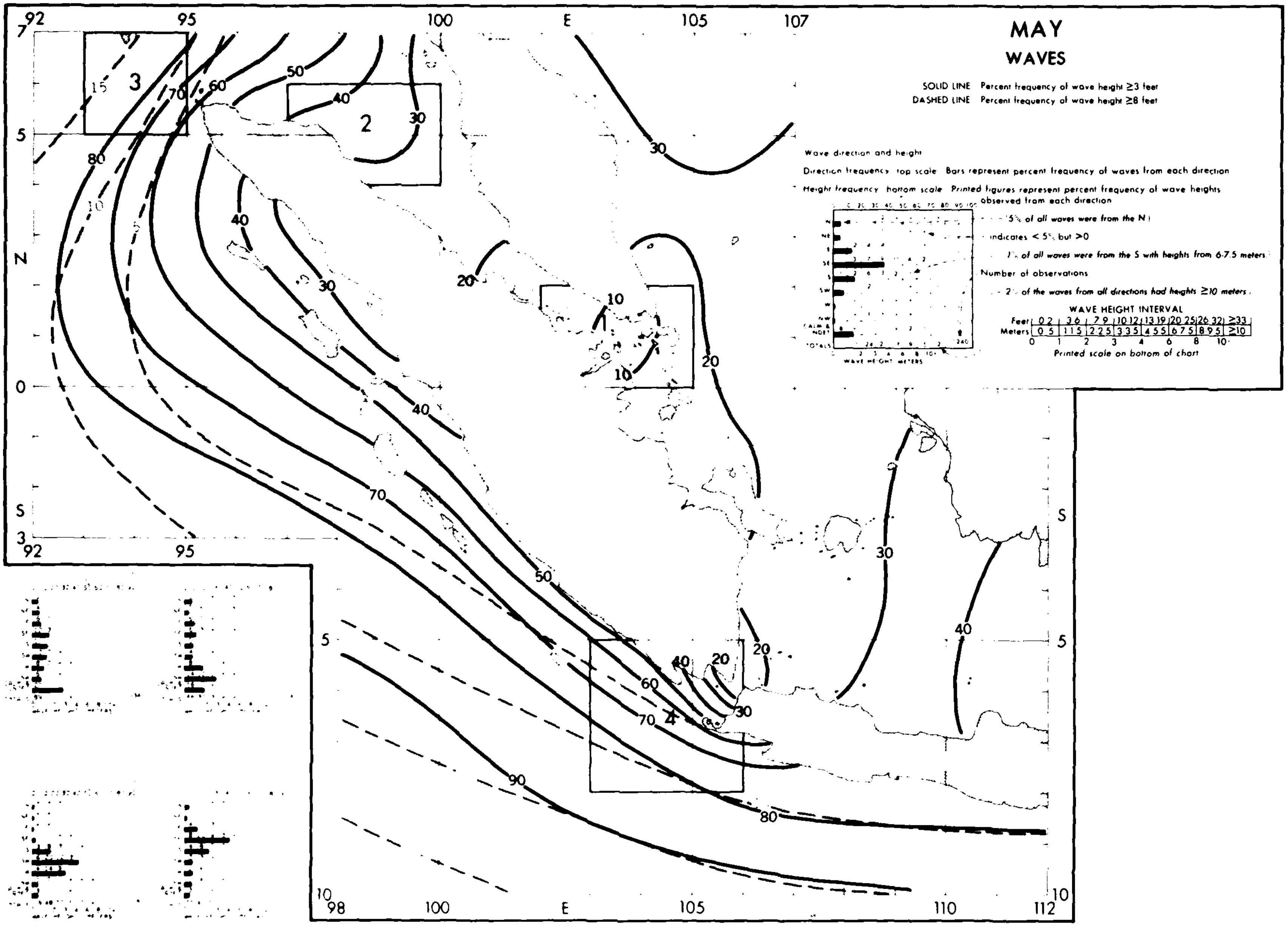

MAY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
E
100
105
7
5
N
0
S
1

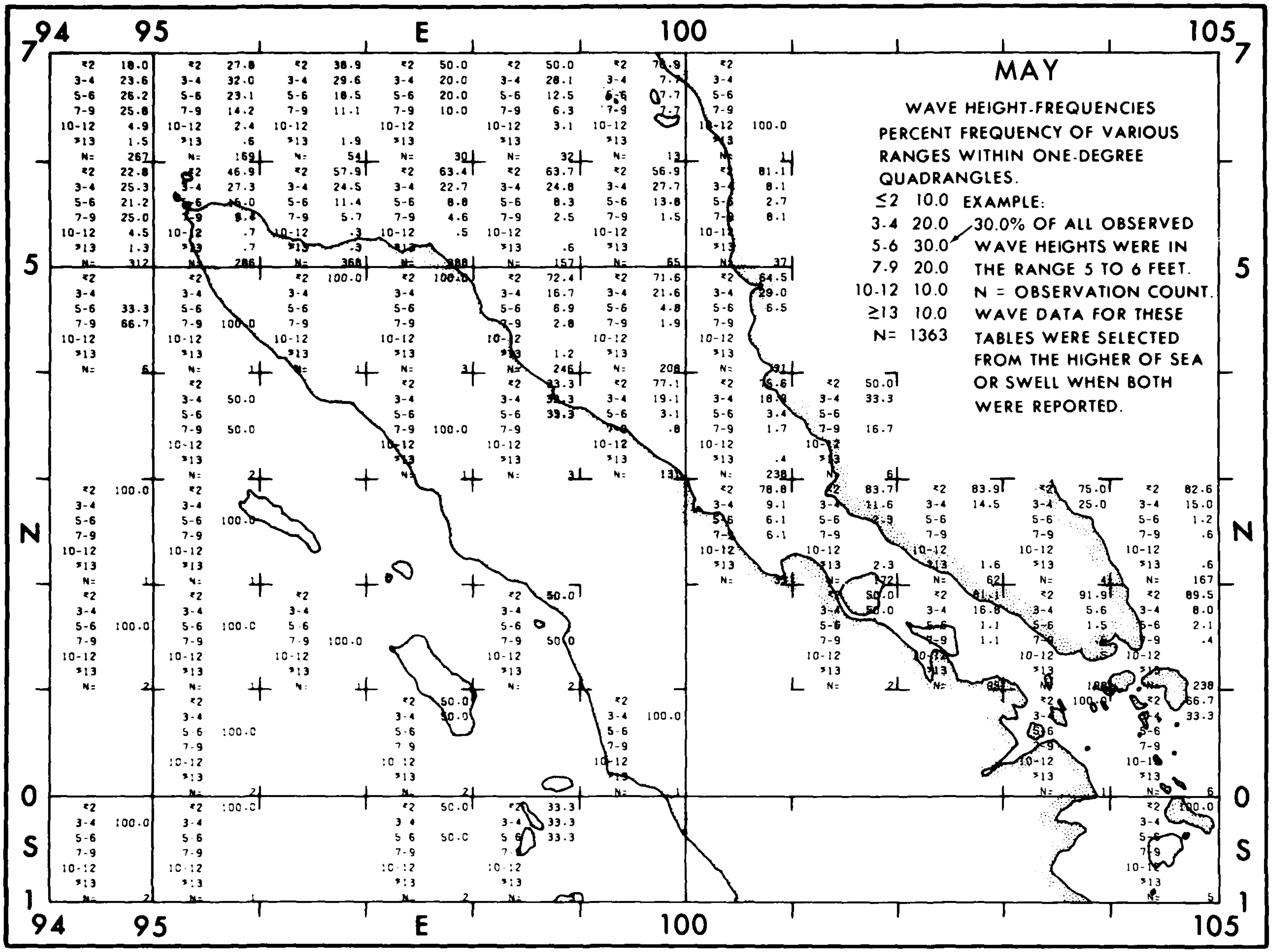

MAY
SURFACE WIND ROSE
99
100
105
110
E
2
S
5
10

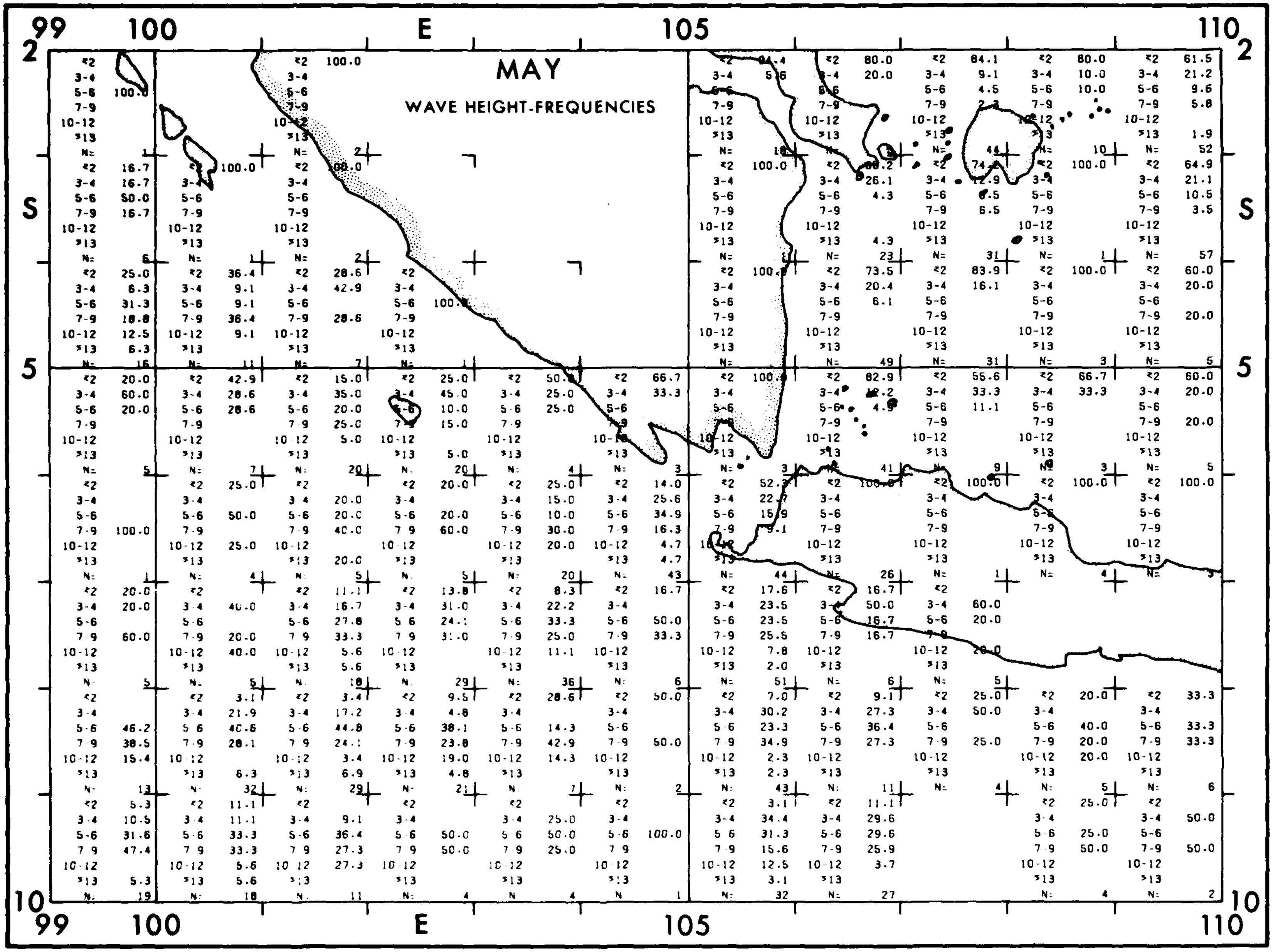


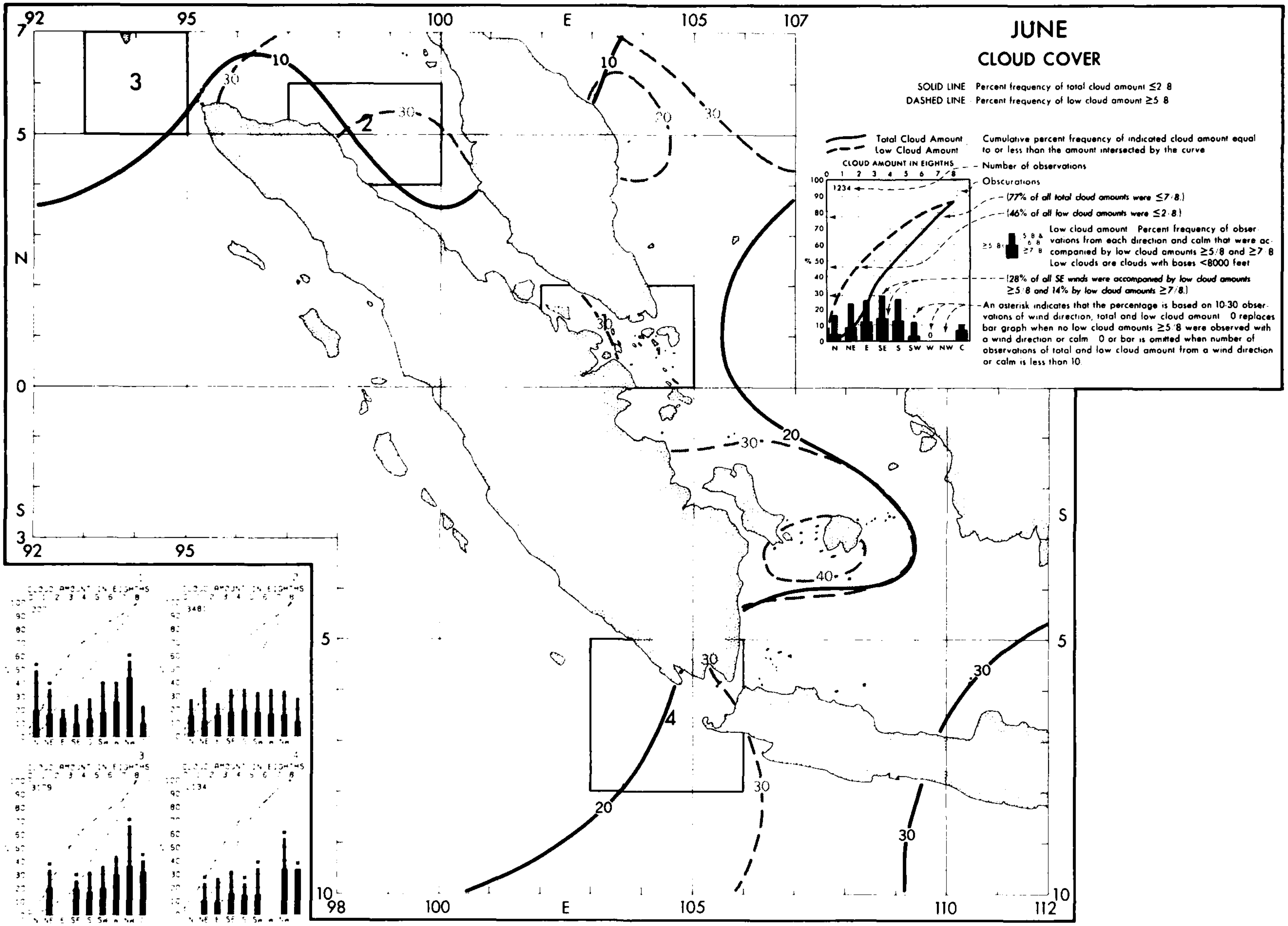
CONVERSION TABLE

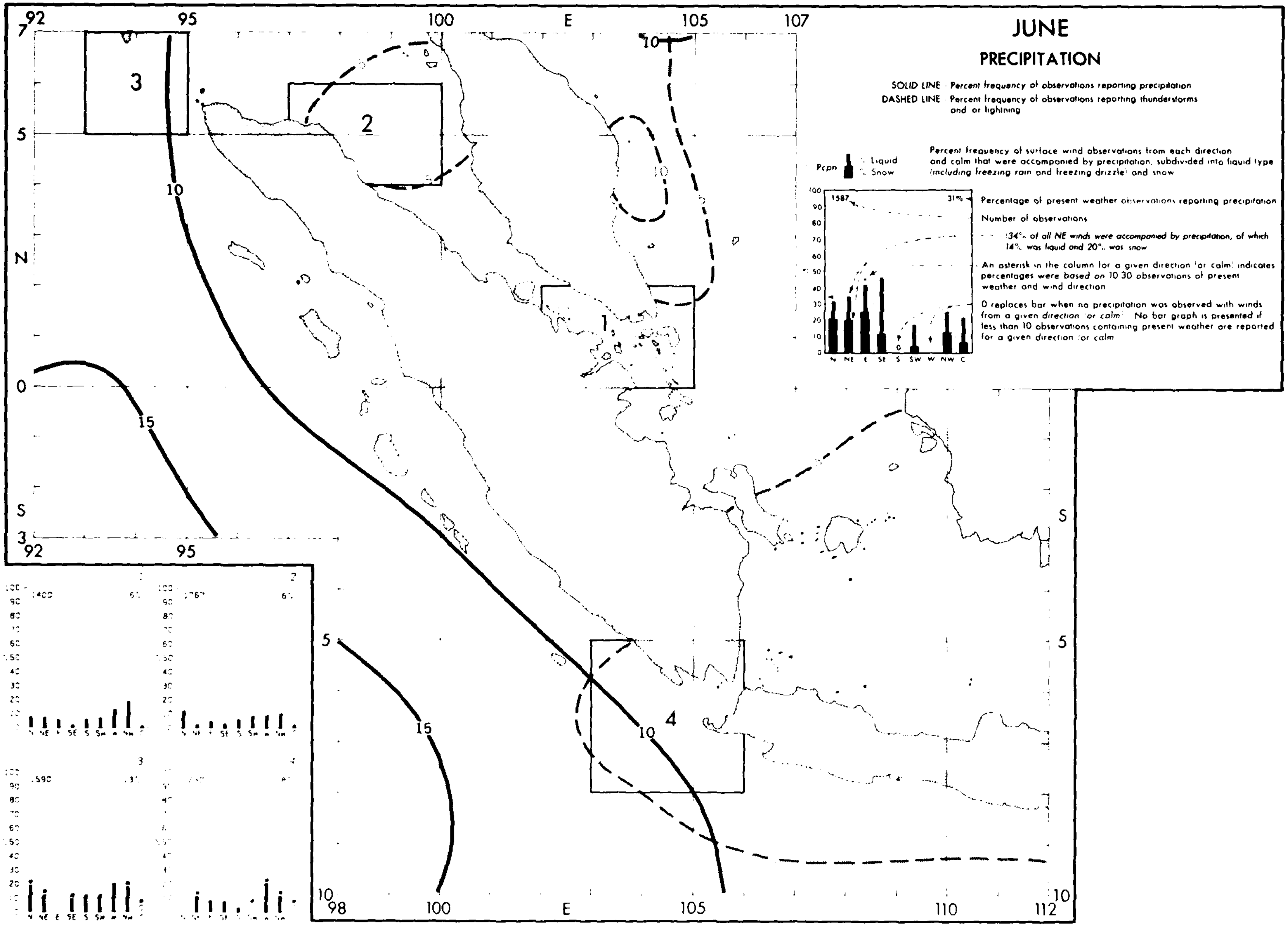
°C		°F
16	–	60.8
17	–	62.6
18	–	64.4
19	–	66.2
20	–	68.0
21	–	69.8
22	–	71.6
23	–	73.4
24	–	75.2
25	–	77.0
26	–	78.8
27	–	80.6
28	–	82.4
29	–	84.2
30	–	86.0
31	–	87.8
32	–	89.6
33	–	91.4
34	–	93.2
35	–	95.0
36	–	96.8
37	–	98.6
38	–	100.4
39	–	102.2

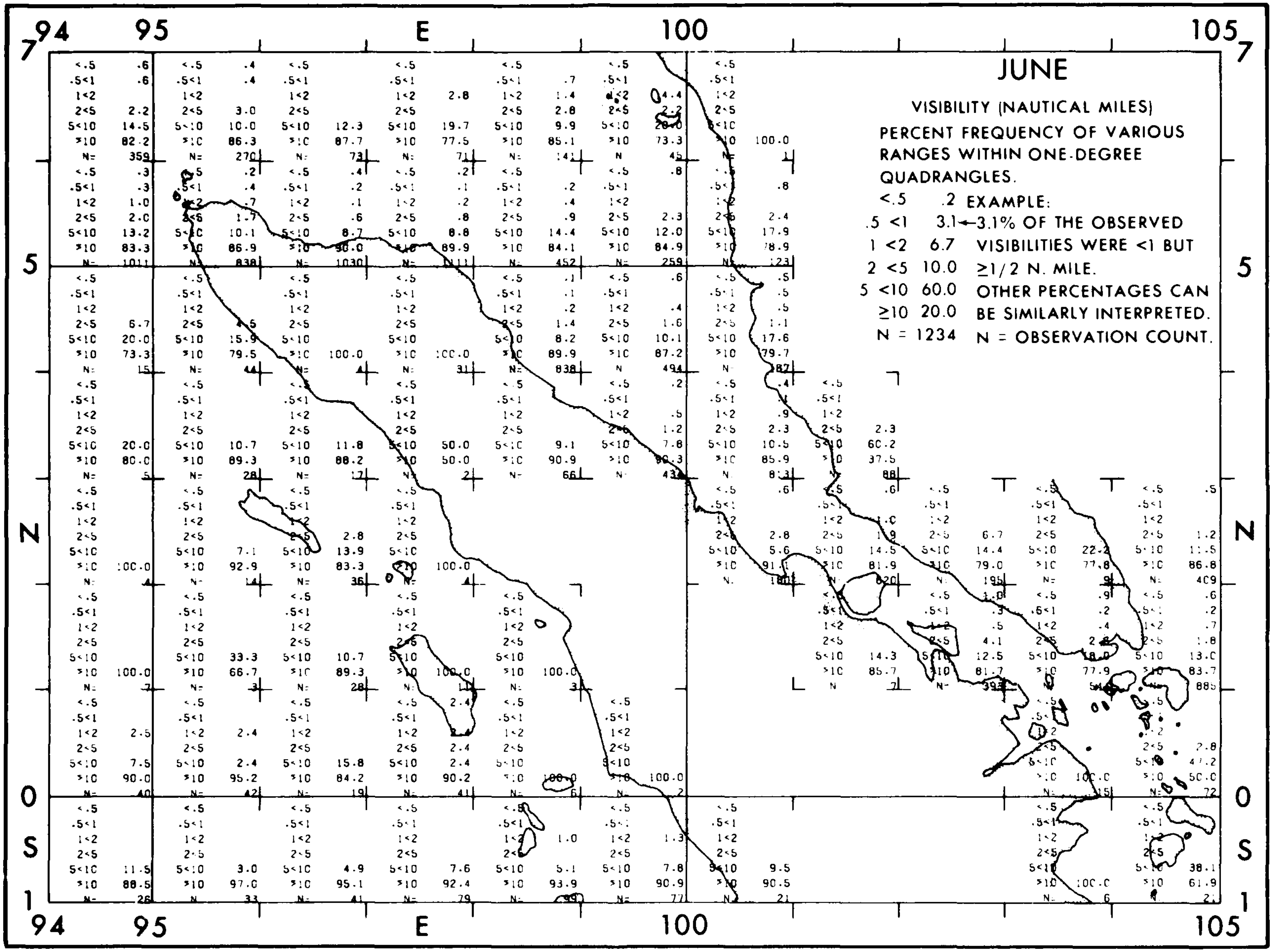

MAY
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency top scale Bars represent percent frequency of waves from each direction
Height frequency bottom scale Printed figures represent percent frequency of wave heights observed from each direction
5% of all waves were from the N
indicates < 5% but >0
1% of all waves were from the S with heights from 6-7.5 meters
Number of observations
2% of the waves from all directions had heights ≥10 meters
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-4.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
92 95 100 E 105 107 110 112 98
7 5 N 0 S 3 5 10
2 3 4
10 15 20 30 40 50 60 70 80 90

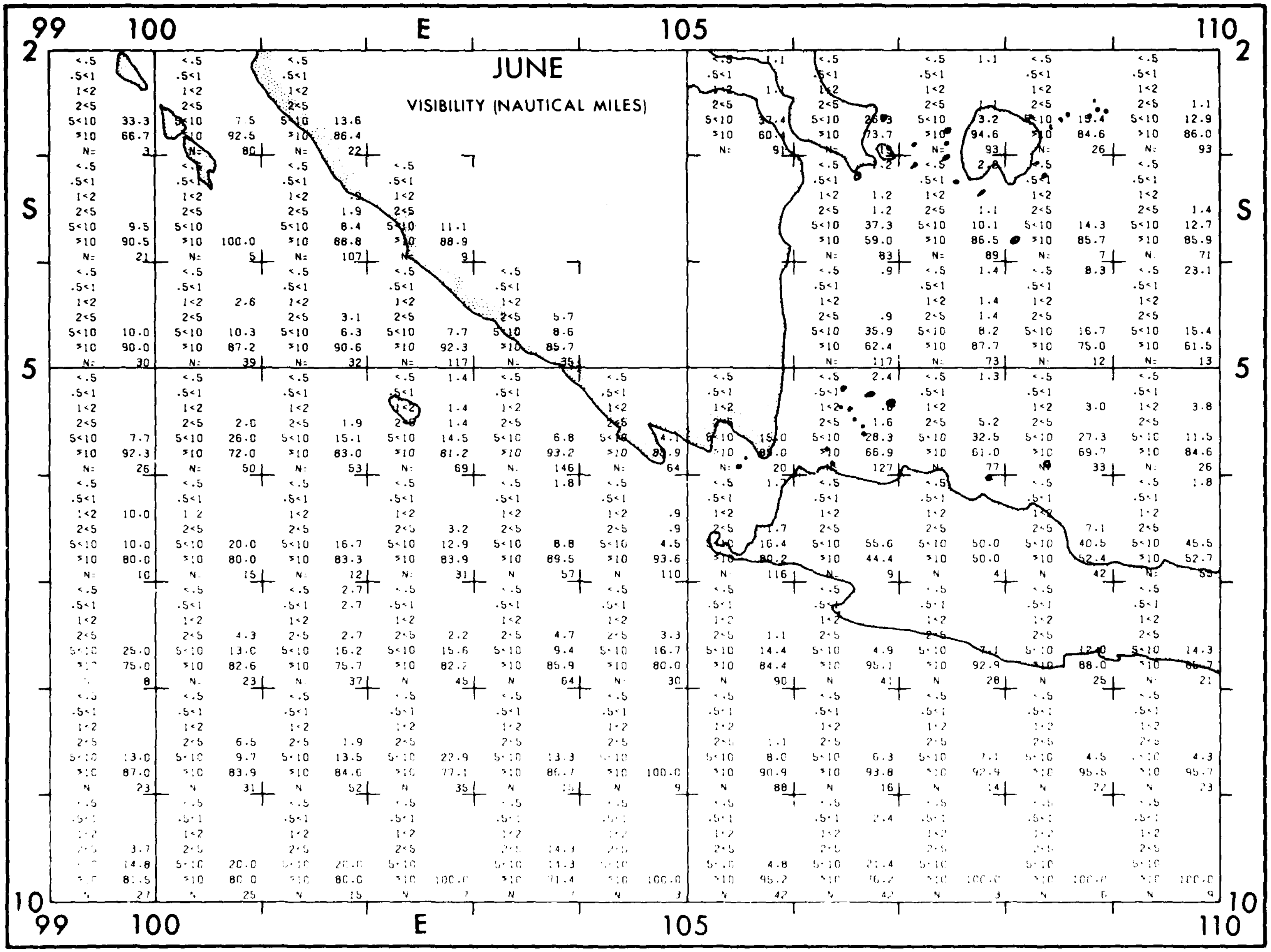

MAY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE: 30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1


MAY
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10


JUNE
CLOUD COVER
SOLID LINE · Percent frequency of total cloud amount ≤2/8
DASHED LINE · Percent frequency of low cloud amount ≥5/8
Total Cloud Amount
Low Cloud Amount
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
CLOUD AMOUNT IN EIGHTHS
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8.)
(46% of all low cloud amounts were ≤2/8.)
Low cloud amount · Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8.)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10.
N NE E SE S SW W NW C
1
2
3
4


JUNE
PRECIPITATION
SOLID LINE · Percent frequency of observations reporting precipitation
DASHED LINE · Percent frequency of observations reporting thunderstorms and or lightning
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation, subdivided into liquid type (including freezing rain and freezing drizzle) and snow
Pcpn
Liquid
Snow
Percentage of present weather observations reporting precipitation
Number of observations
34% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction (or calm) indicates percentages were based on 10-30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction (or calm). No bar graph is presented if less than 10 observations containing present weather are reported for a given direction (or calm)
1587
31%
N NE E SE S SW W NW C
1
2
3
4
10
15
5
92
95
100
105
107
110
112
98
E
N
S
0
7
3


JUNE
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1


JUNE
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10

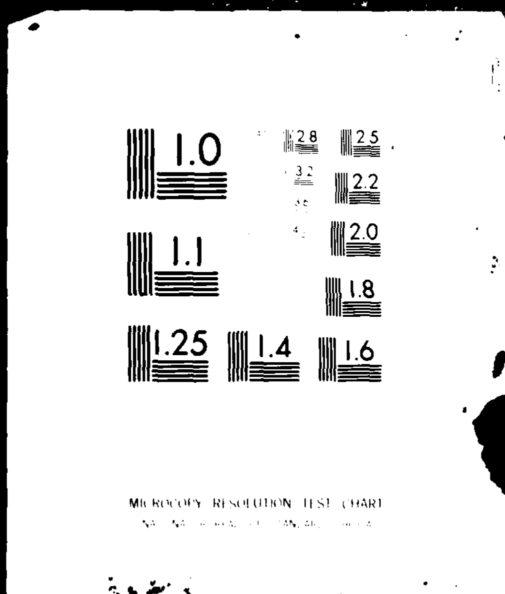
AD-A115 323   NAVAL OCEANOGRAPHY COMMAND DETACHMENT ASHEVILLE NC   F/G 4/2
CLIMATIC STUDY OF THE MALACCA AND SUNDA STRAITS, NEAR COASTAL Z--ETC(U)
APR 82

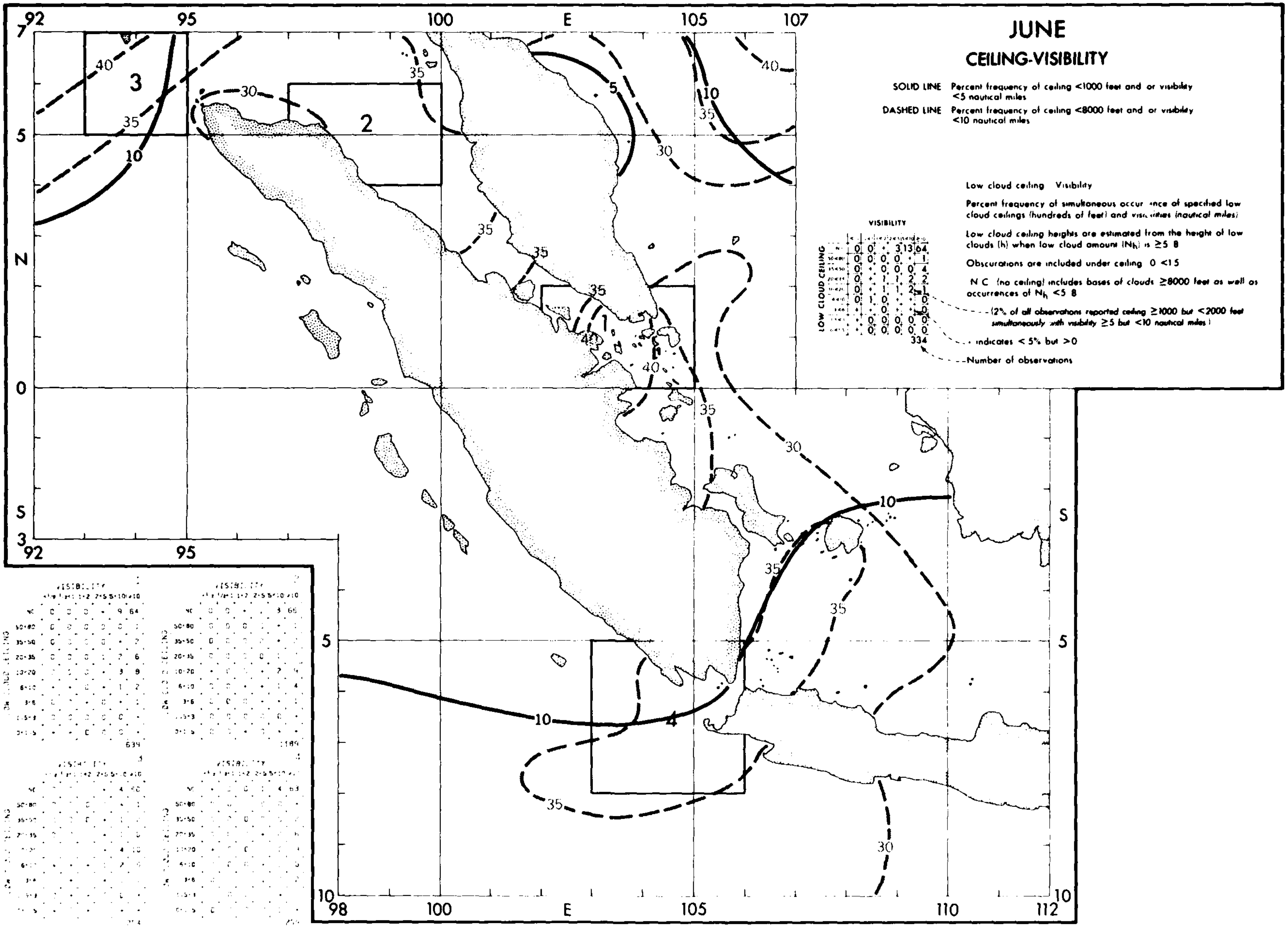
UNCLASSIFIED   NL

2 OF 3
AD A
115323

2 OF 3

AD A 115323




JUNE
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
Obscurations are included under ceiling 0 <15
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles)
indicates < 5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
92
95
100
E
105
107
110
112
98
N
S
0
5
7
3
10
1
2
3
4

JUNE

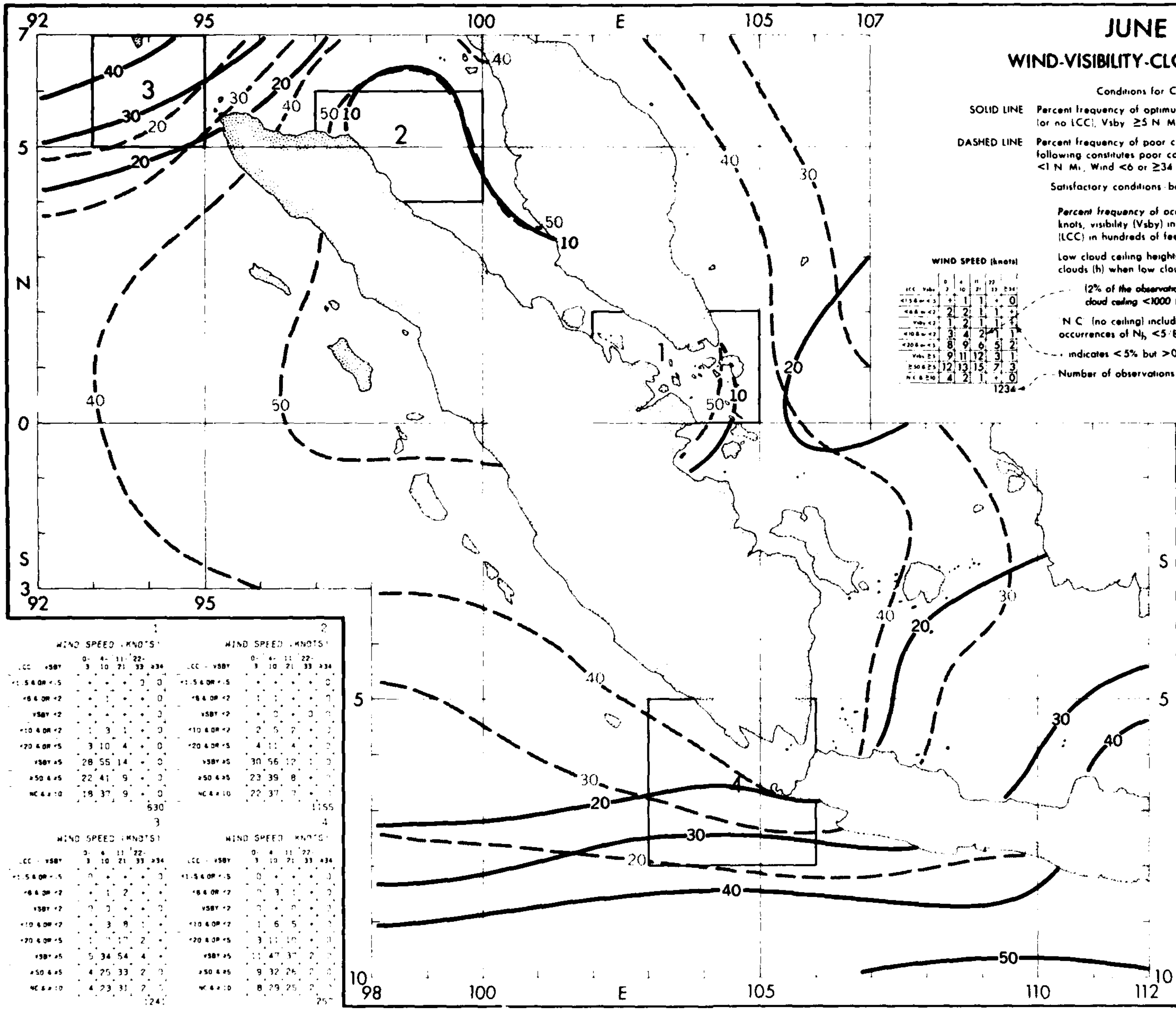
WIND-VISIBILITY-CLOUDINESS

Conditions for Carrier Operations

SOLID LINE — Percent frequency of optimum conditions LCC ≥5000 ft (or no LCC), Vsby ≥5 N Mi and Wind 11-21 kts

DASHED LINE — Percent frequency of poor conditions. Any one of the following constitutes poor conditions: LCC <300 ft, Vsby <1 N Mi, Wind <6 or ≥34 kts

Satisfactory conditions between poor and optimum



WIND SPEED (knots) LCC - Vsby	0-3	4-10	11-21	22-33	≥34
<1.5 & or <.5	•	1	1	•	0
<6 & or <2	2	2	1	1	•
Vsby <2	1	2	1	1	1
<10 & or <2	3	4	2	1	1
<20 & or <5	8	9	6	5	2
Vsby ≥5	9	11	12	3	1
≥50 & ≥5	12	13	15	7	3
NC & ≥10	4	2	1	•	0
					1234

Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles, and low cloud ceiling (LCC) in hundreds of feet

Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (N_h) is ≥5/8

(2% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and/or visibility <2 nautical miles)

N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of N_h <5/8

• indicates <5% but >0

Number of observations

1

LCC - VSBY	0-3	4-10	11-21	22-33	≥34
<1.5 & OR <.5	•	•	•	0	0
<6 & OR <2	•	1	•	•	0
VSBY <2	•	•	•	•	0
<10 & OR <2	1	3	1	•	0
<20 & OR <5	3	10	4	•	0
VSBY ≥5	28	55	14	•	0
≥50 & ≥5	22	41	9	•	0
NC & ≥10	18	37	9	•	0
					630

2

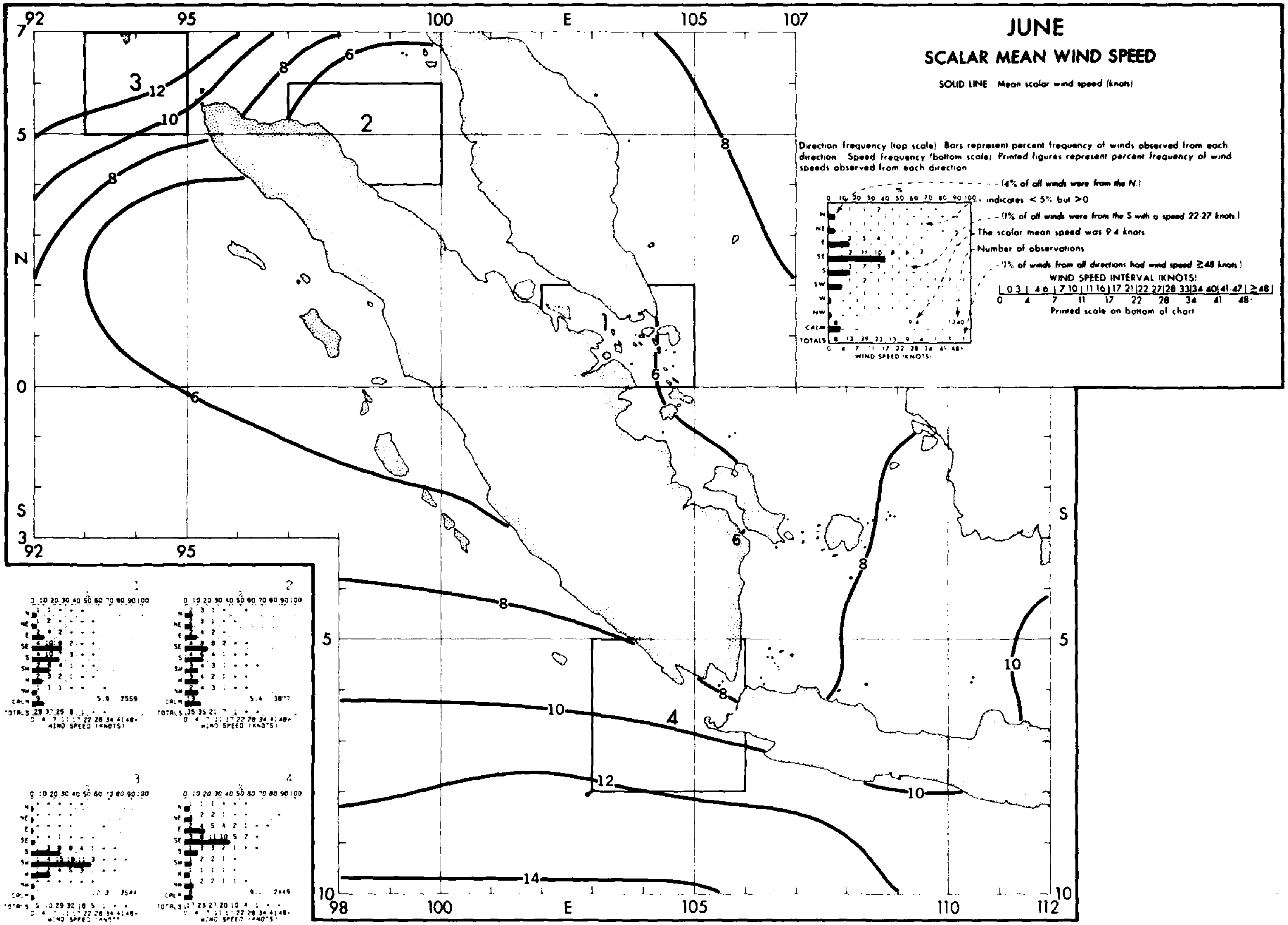
LCC - VSBY	0-3	4-10	11-21	22-33	≥34
<1.5 & OR <.5	•	•	•	•	0
<6 & OR <2	1	1	•	•	0
VSBY <2	•	0	•	0	0
<10 & OR <2	2	5	2	•	0
<20 & OR <5	4	11	4	•	0
VSBY ≥5	30	56	12	1	0
≥50 & ≥5	23	39	8	•	0
NC & ≥10	22	37	7	•	0
					1155

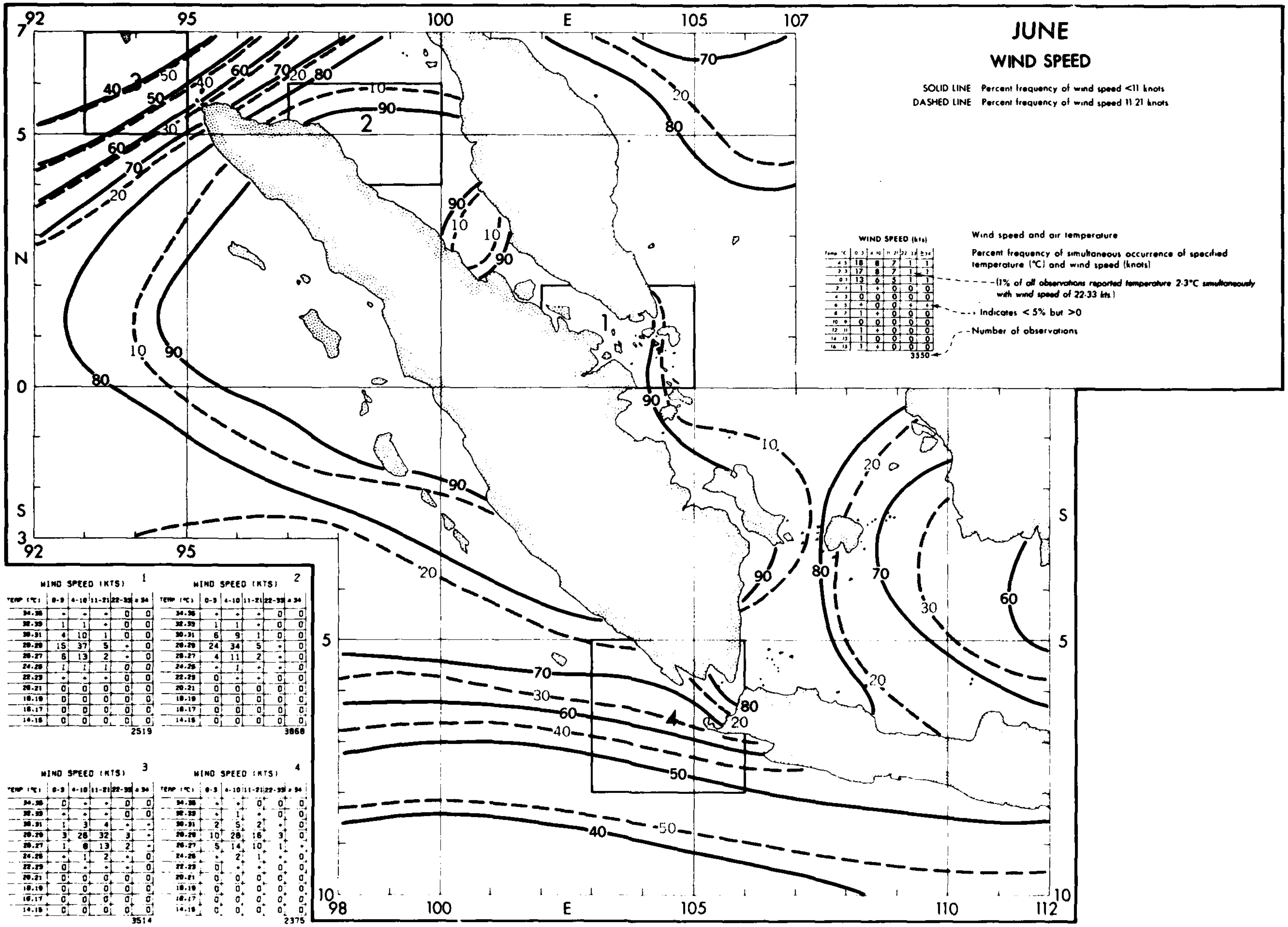
3

LCC - VSBY	0-3	4-10	11-21	22-33	≥34
<1.5 & OR <.5	0	•	•	•	0
<6 & OR <2	•	1	2	•	•
VSBY <2	0	0	•	•	0
<10 & OR <2	•	3	8	1	•
<20 & OR <5	1	[illegible]	17	2	•
VSBY ≥5	5	34	54	4	•
≥50 & ≥5	4	25	33	2	0
NC & ≥10	4	23	31	2	0
					1241

4

LCC - VSBY	0-3	4-10	11-21	22-33	≥34
<1.5 & OR <.5	0	•	•	•	0
<6 & OR <2	0	3	1	•	0
VSBY <2	0	•	0	•	0
<10 & OR <2	1	6	5	•	0
<20 & OR <5	3	11	10	•	0
VSBY ≥5	11	47	37	2	0
≥50 & ≥5	9	32	26	2	0
NC & ≥10	8	29	25	2	0
					257


JUNE
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots)
Direction frequency (top scale) Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale) Printed figures represent percent frequency of wind speeds observed from each direction
(4% of all winds were from the N)
· indicates < 5% but > 0
(1% of all winds were from the S with a speed 22-27 knots)
The scalar mean speed was 9.4 knots
Number of observations
(1% of winds from all directions had wind speed ≥48 knots)
WIND SPEED INTERVAL (KNOTS)
0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 22-27 | 28-33 | 34-40 | 41-47 | ≥48
0 4 7 11 17 22 28 34 41 48+
Printed scale on bottom of chart
WIND SPEED (KNOTS)
92
95
100
105
107
110
112
98
E
N
S
0
5
10
1
2
3
4



WIND SPEED (kts)

Temp °C	0-3	4-10	11-21	22-33	≥34
4 5	18	8	7	1	1
2 3	17	8	7	1	1
0 1	13	6	5	1	1
-2 -1	1	+	0	0	0
-4 -3	0	0	0	0	0
-6 -5	+	0	0	+	+
-8 -7	1	+	0	0	0
-10 -9	0	0	0	0	0
-12 -11	1	+	0	0	0
-14 -13	1	0	0	0	0
-16 -15	1	+	0	0	0

3550

1

WIND SPEED (KTS)

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	+	+	+	0	0
32-33	1	1	+	0	0
30-31	4	10	1	0	0
28-29	15	37	5	+	0
26-27	6	13	2	+	0
24-25	1	1	1	0	0
22-23	+	+	+	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

2519

2

WIND SPEED (KTS)

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	+	+	+	0	0
32-33	1	1	+	0	0
30-31	6	9	1	0	0
28-29	24	34	5	+	0
26-27	4	11	2	+	0
24-25	+	1	+	+	0
22-23	0	+	+	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

3868

3

WIND SPEED (KTS)

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	0	+	+	0	0
32-33	+	+	+	0	0
30-31	1	3	4	+	+
28-29	3	26	32	3	+
26-27	1	8	13	2	+
24-25	+	1	2	+	0
22-23	0	+	+	+	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

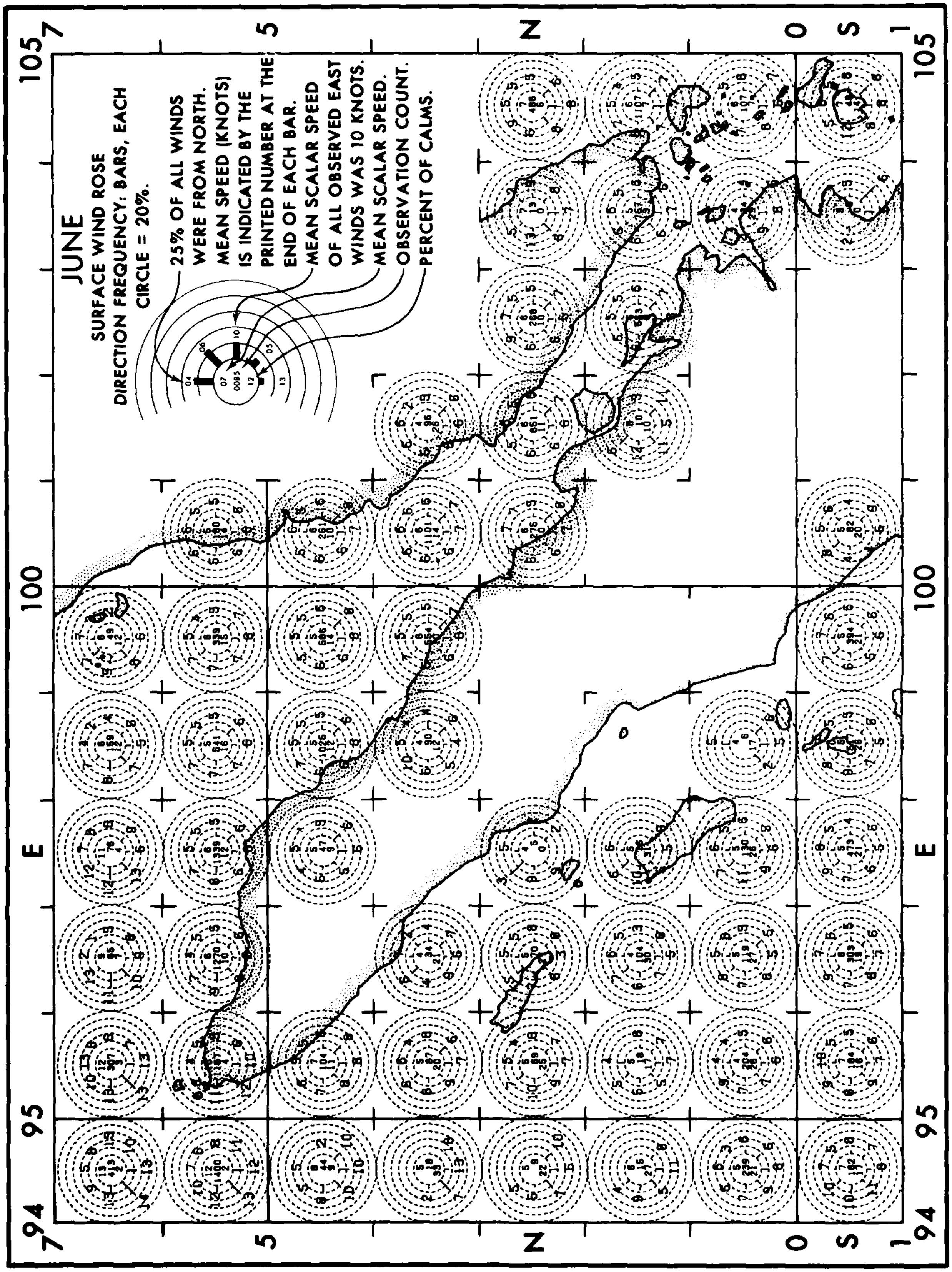
3514

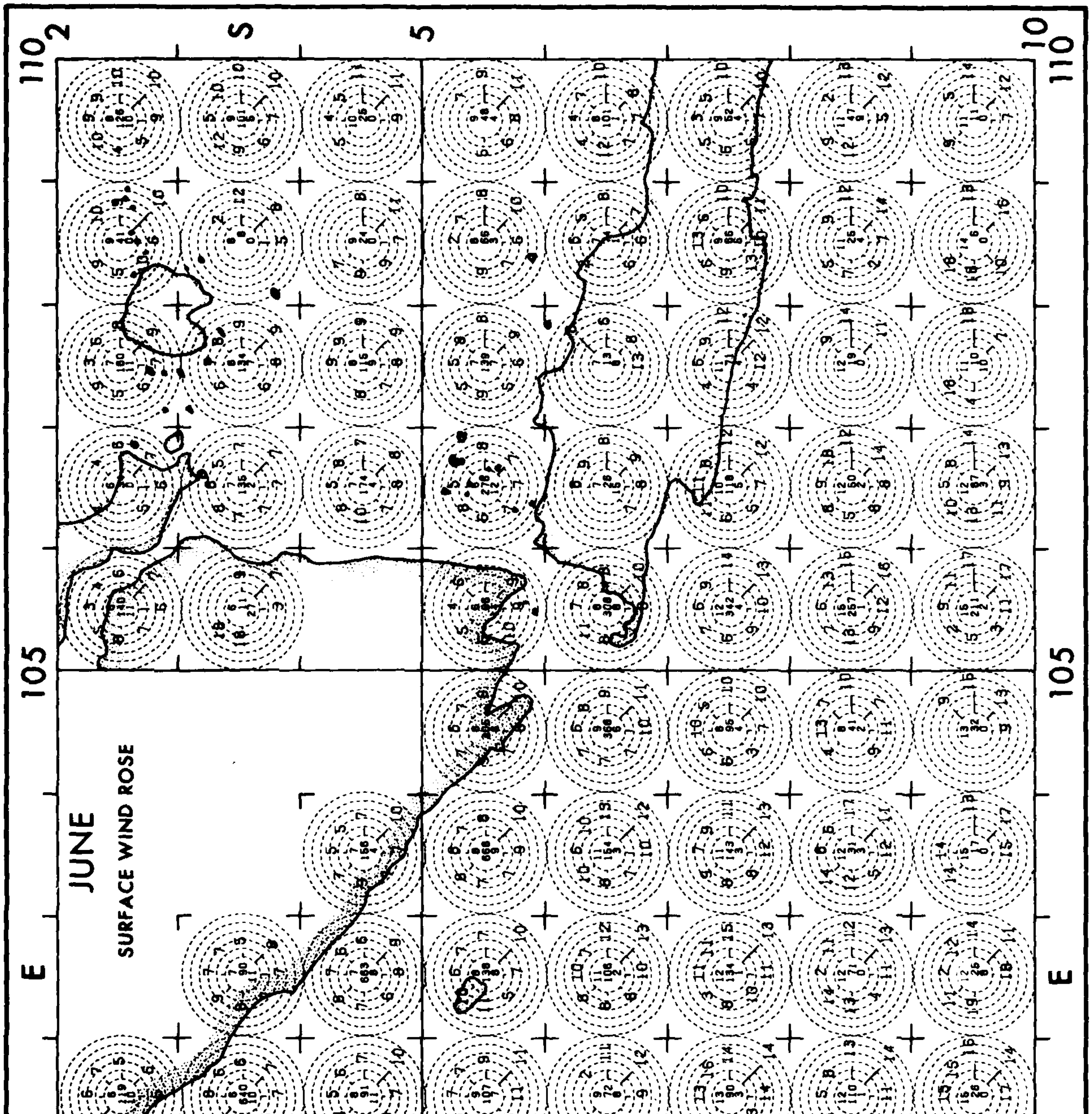
4

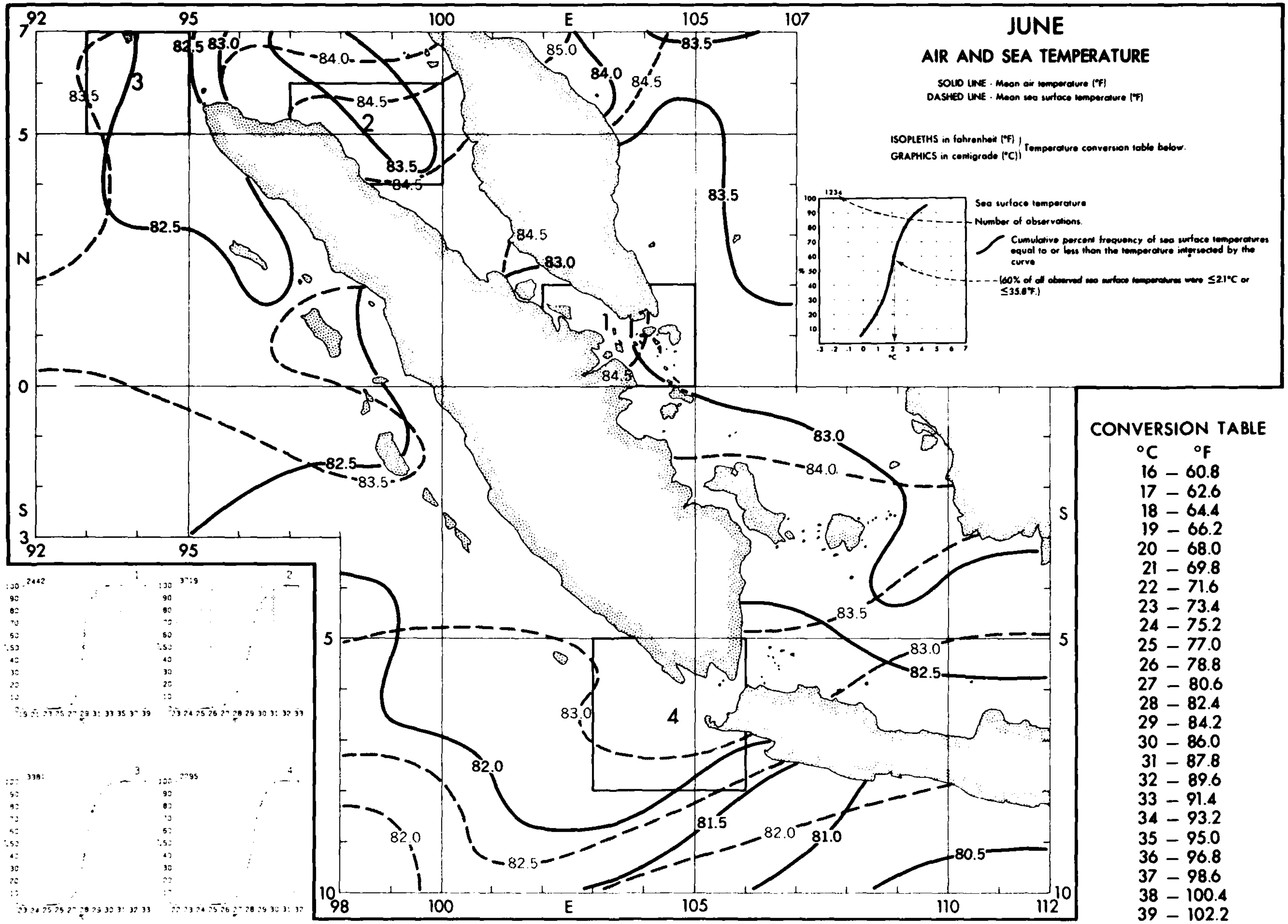
WIND SPEED (KTS)

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	+	+	0	0	0
32-33	+	1	+	0	0
30-31	2	5	2	+	0
28-29	10	28	16	3	0
26-27	5	14	10	1	+
24-25	+	2	1	+	0
22-23	0	+	+	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

2375

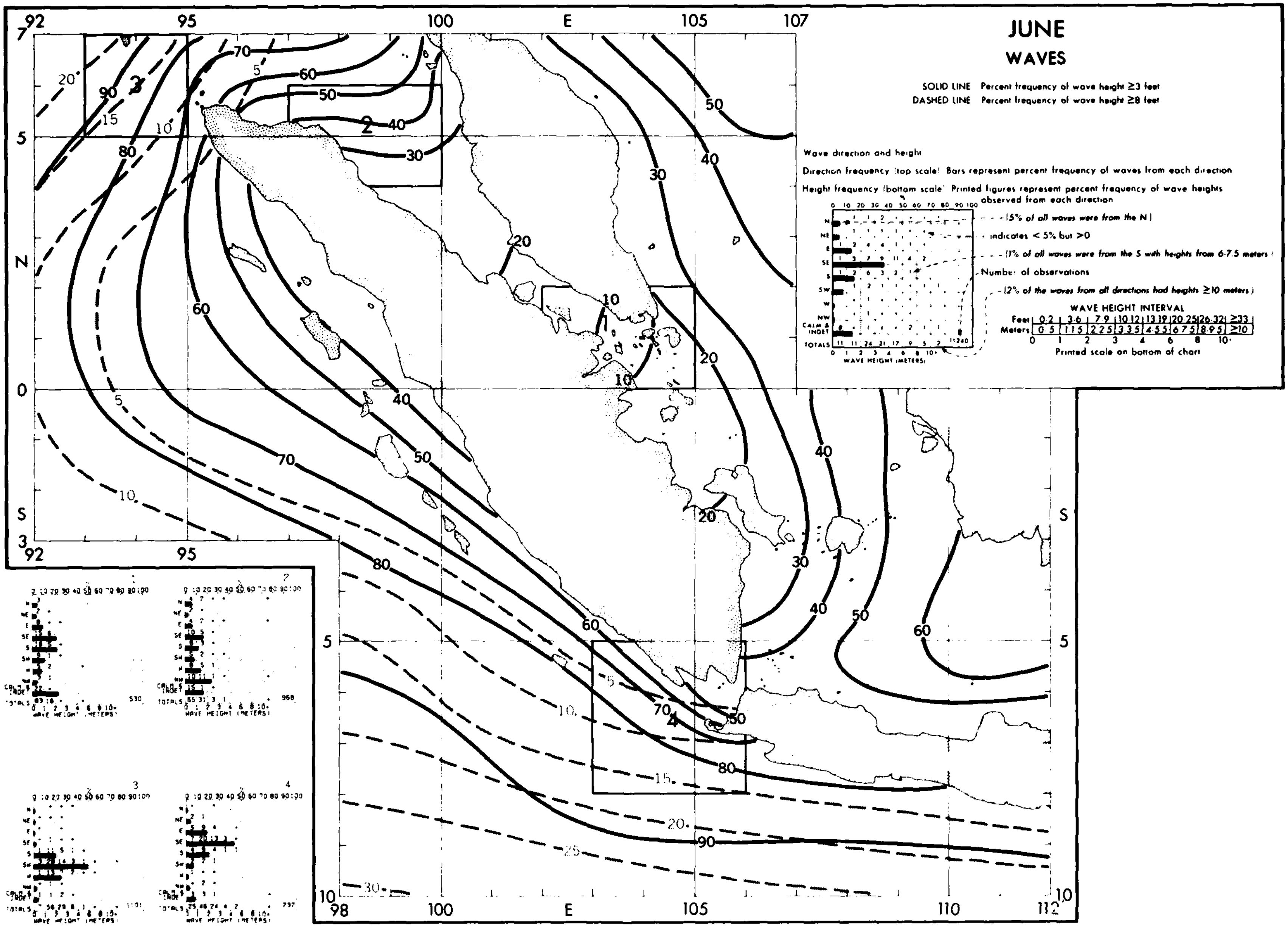

JUNE
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
105
100
E
95
94
7
5
N
0
S
1

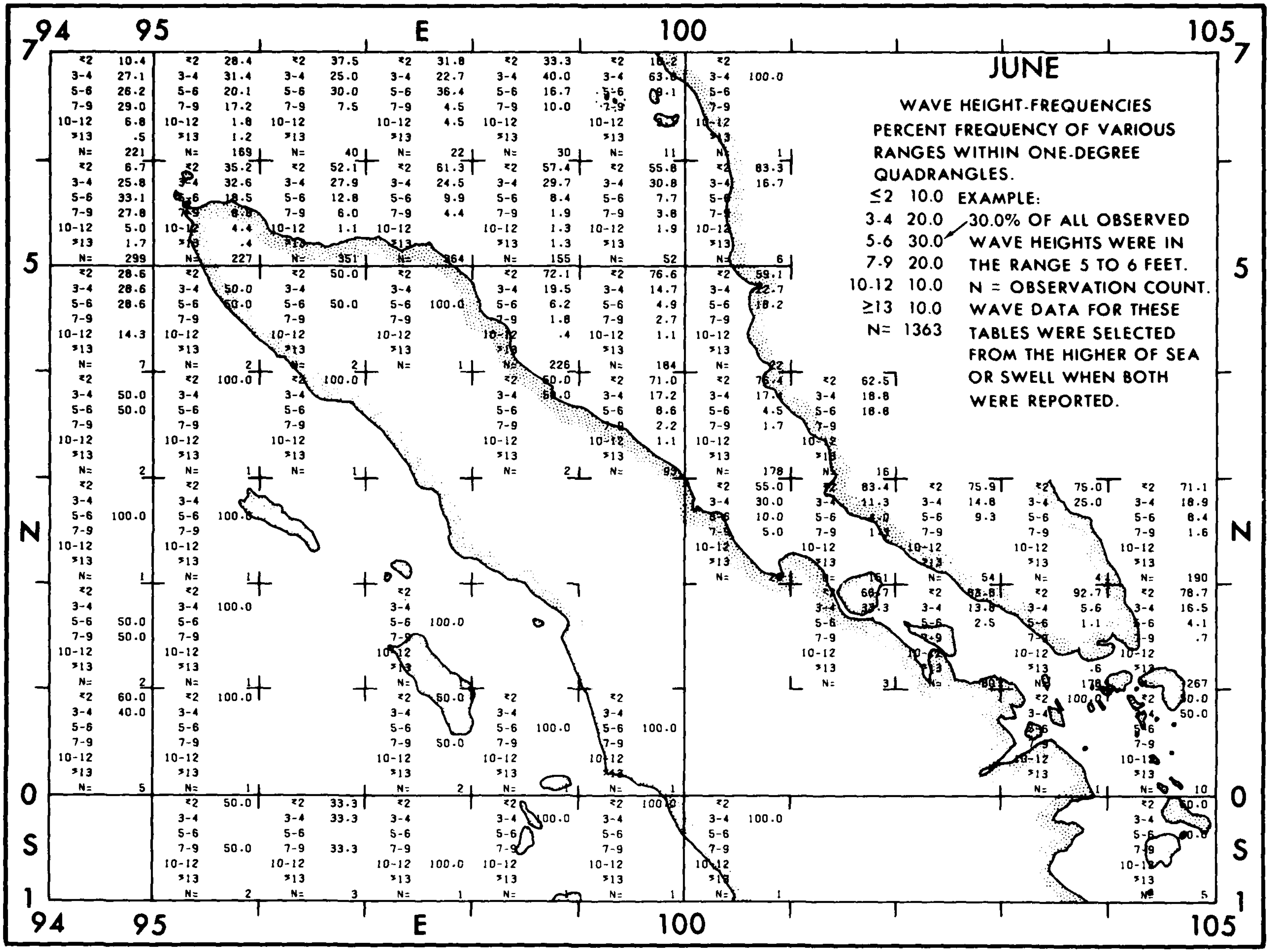

JUNE
SURFACE WIND ROSE

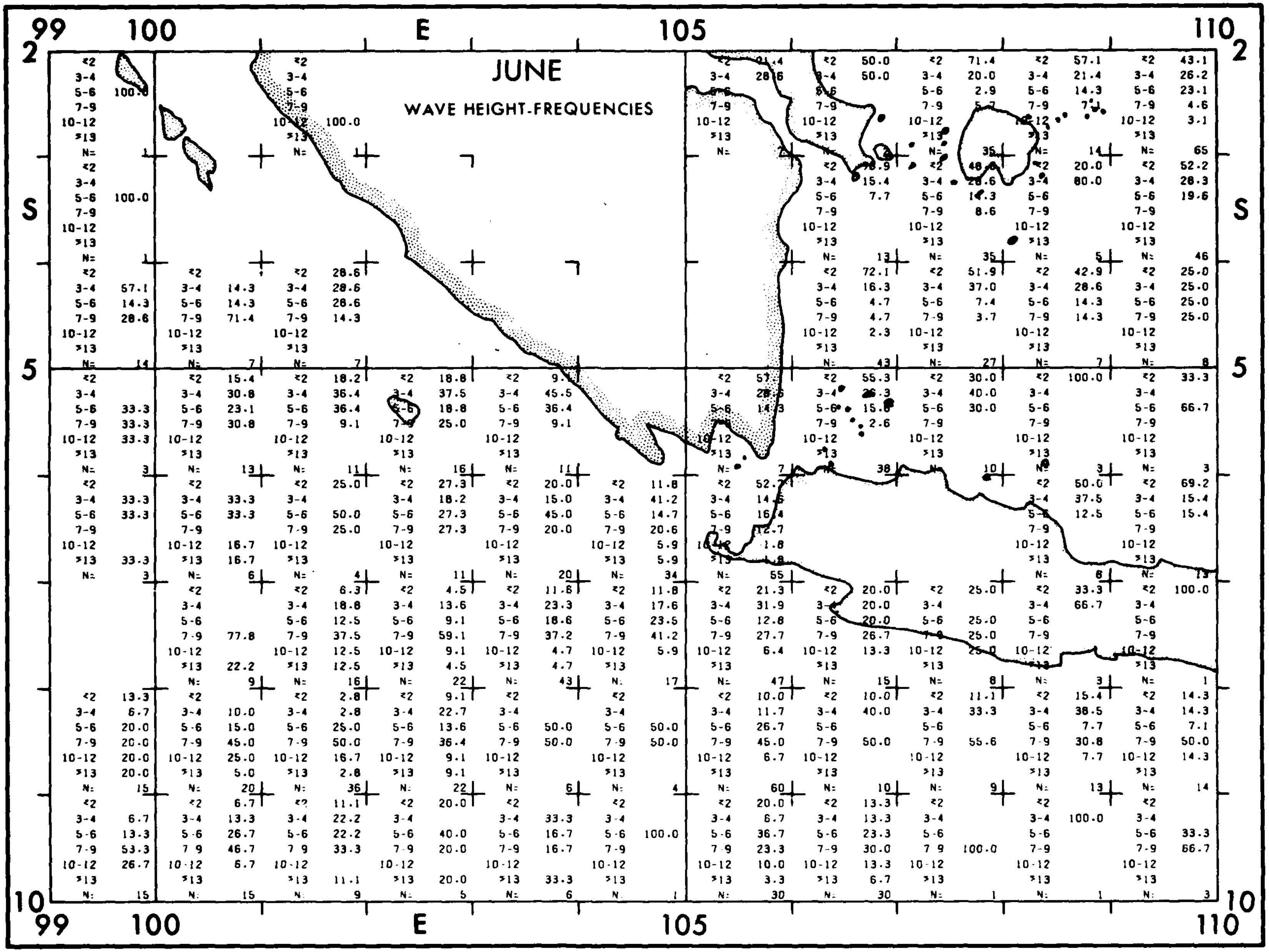


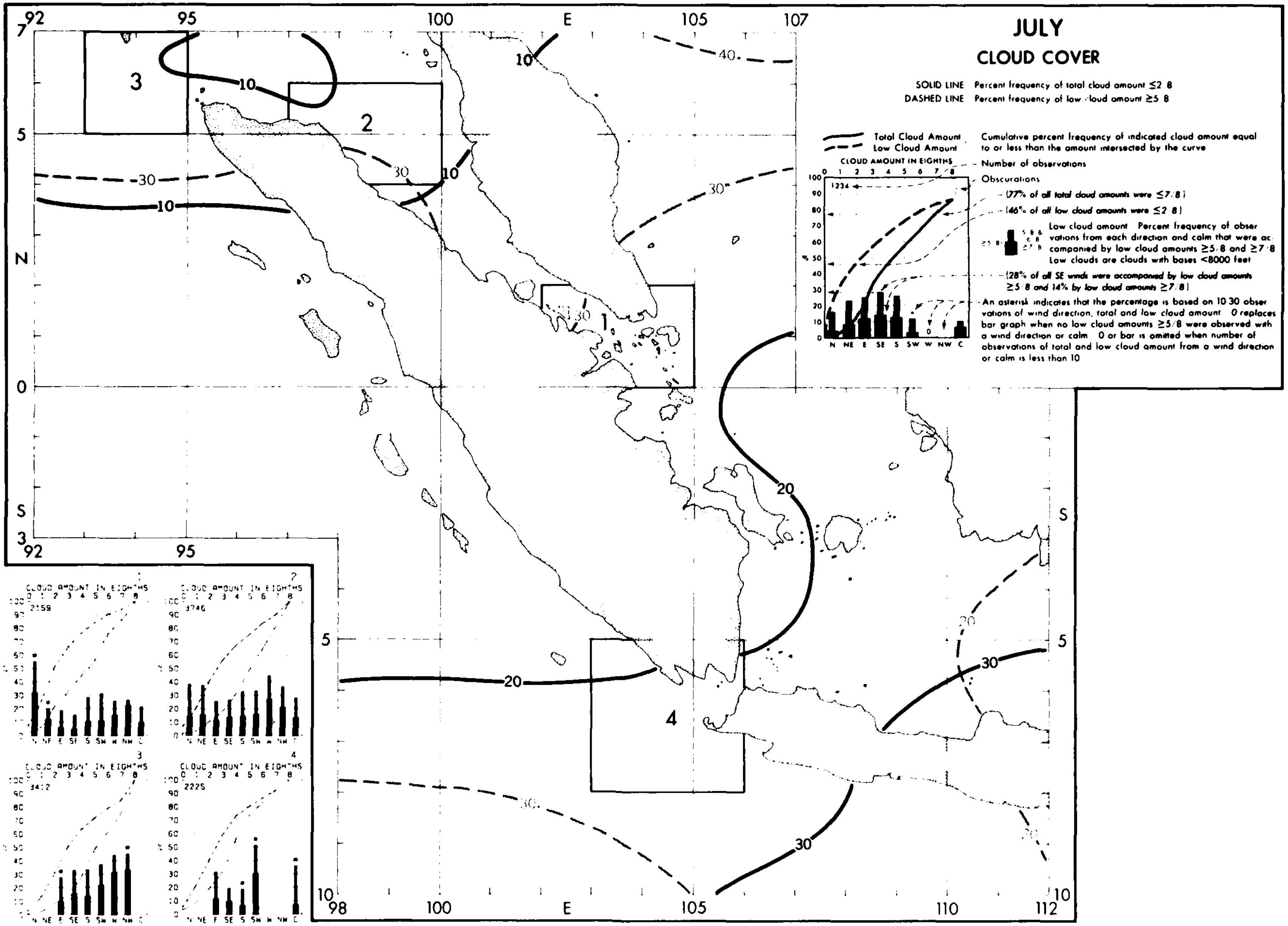
CONVERSION TABLE

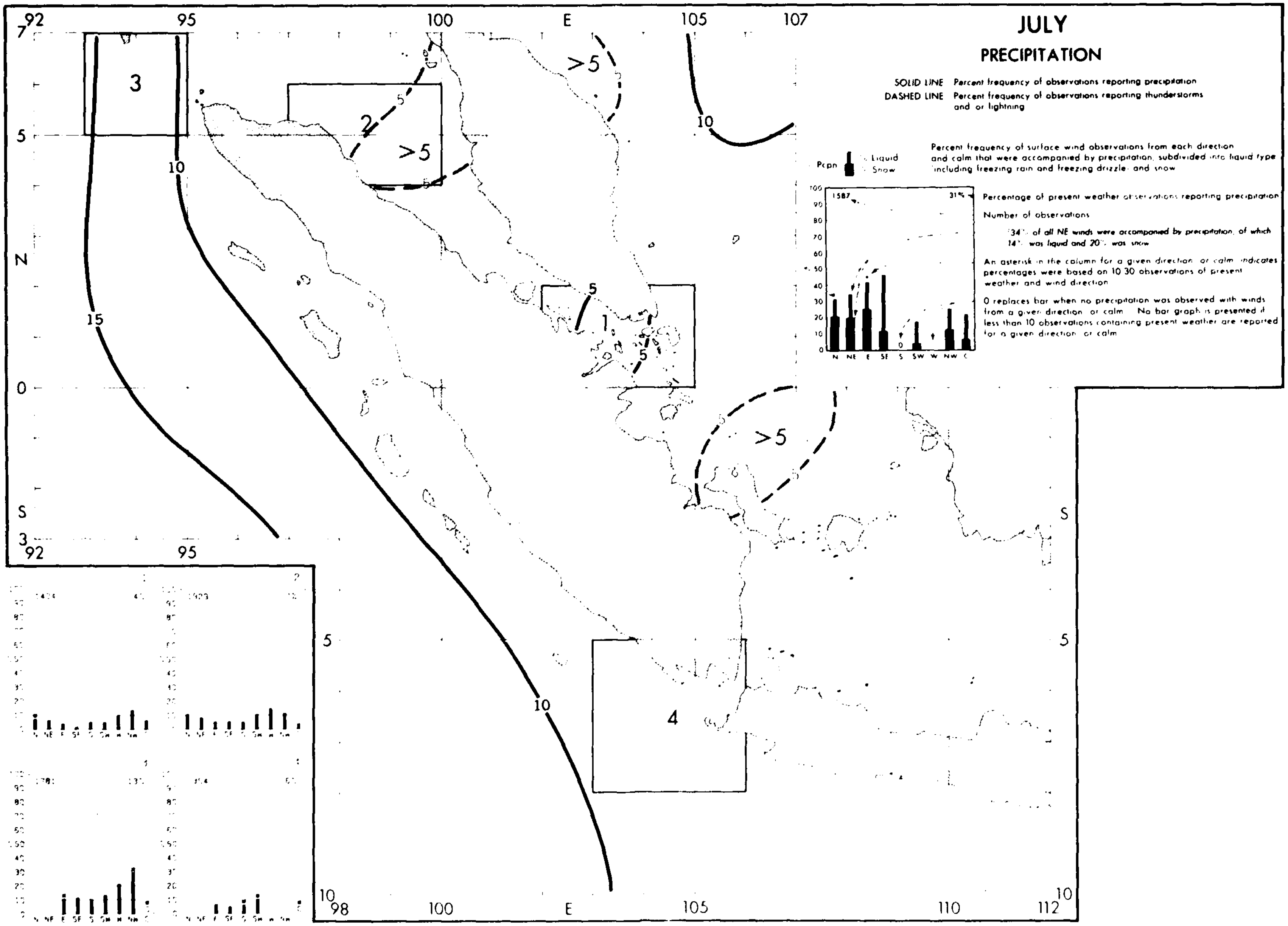
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2

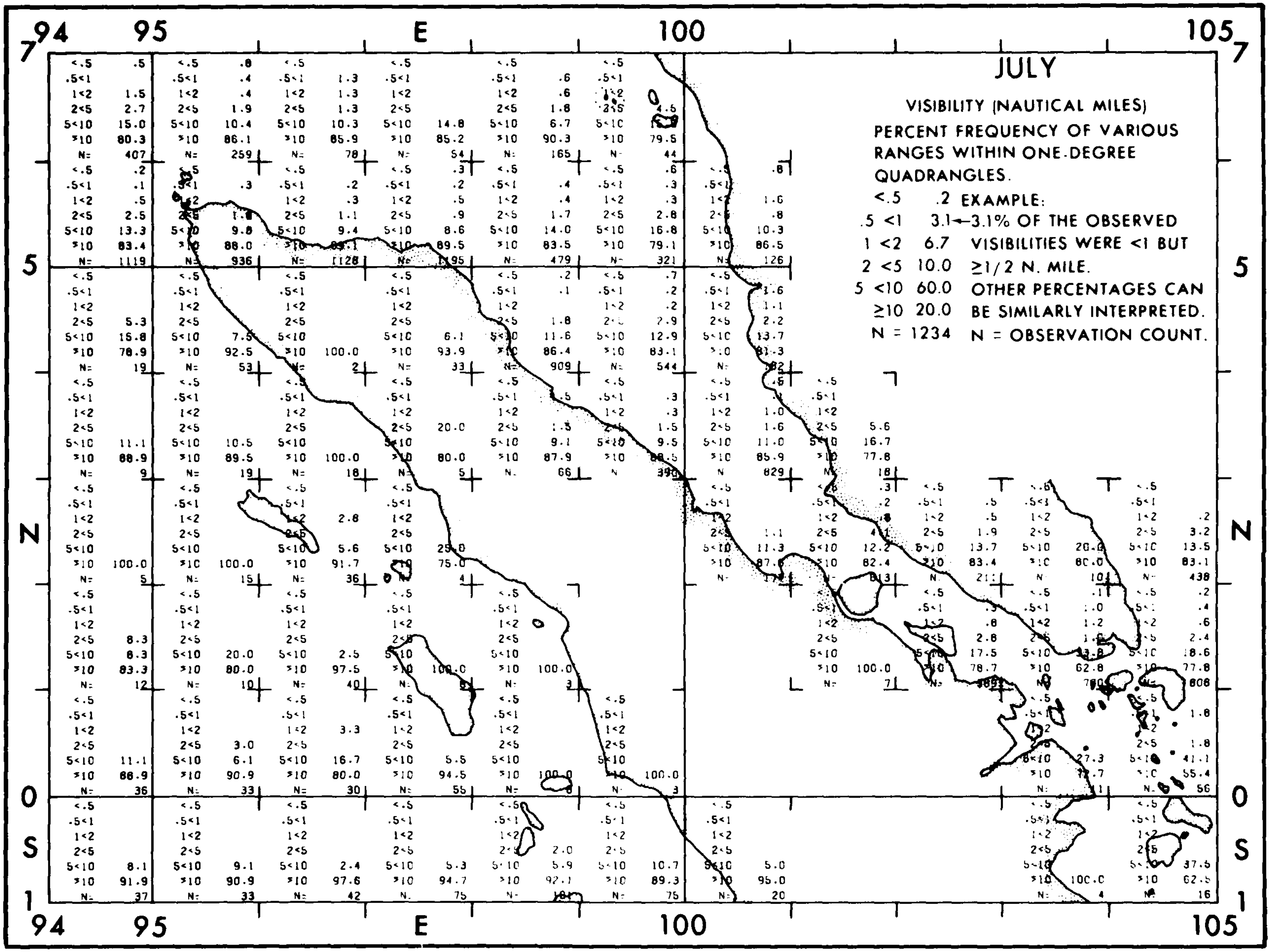

JUNE
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency (top scale) Bars represent percent frequency of waves from each direction
Height frequency (bottom scale) Printed figures represent percent frequency of wave heights observed from each direction
(5% of all waves were from the N)
indicates < 5% but >0
(1% of all waves were from the S with heights from 6-7.5 meters)
Number of observations
(2% of the waves from all directions had heights ≥10 meters)
WAVE HEIGHT INTERVAL
Printed scale on bottom of chart
WAVE HEIGHT (METERS)

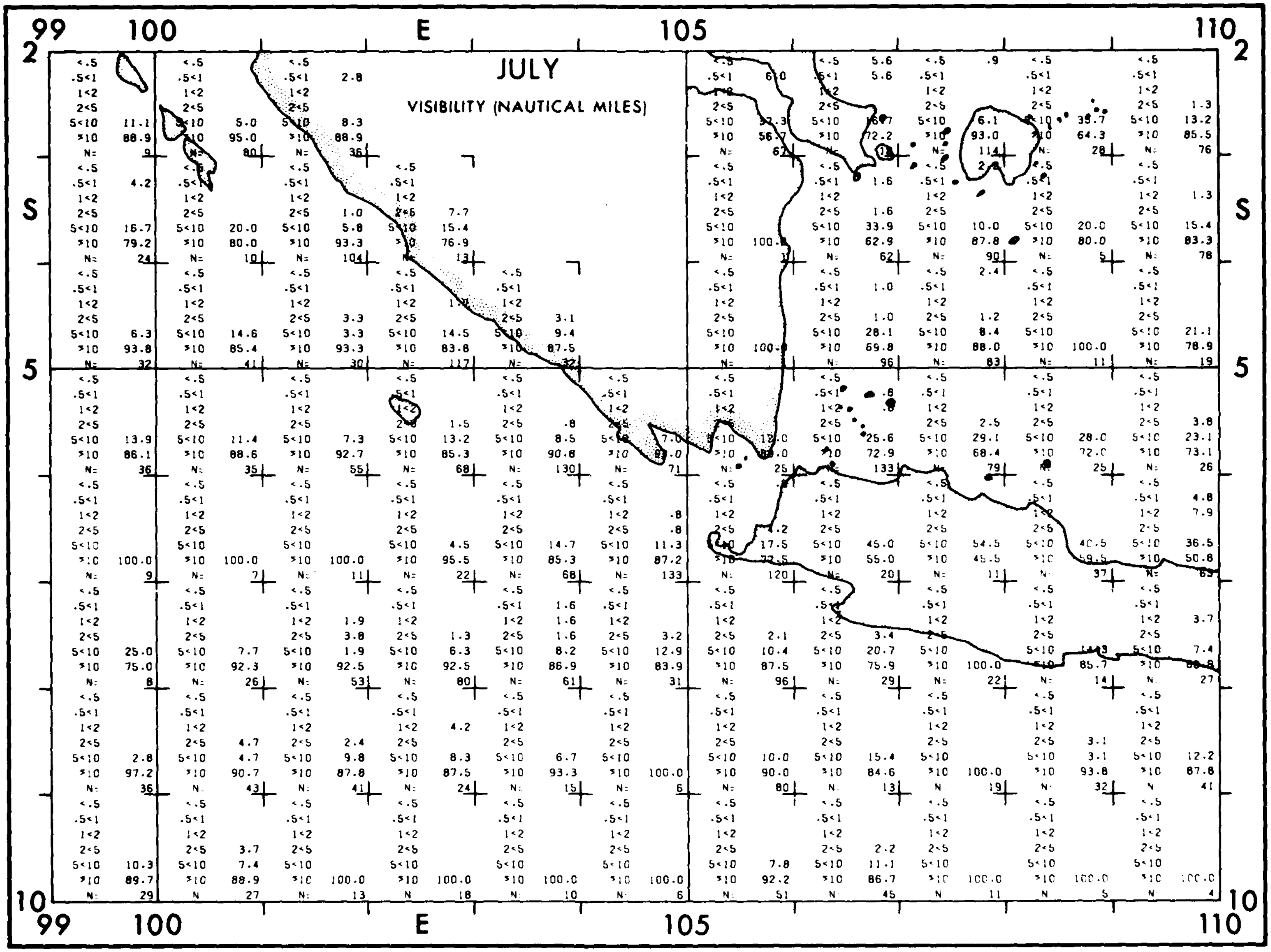

JUNE
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED
WAVE HEIGHTS WERE IN
THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE
TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

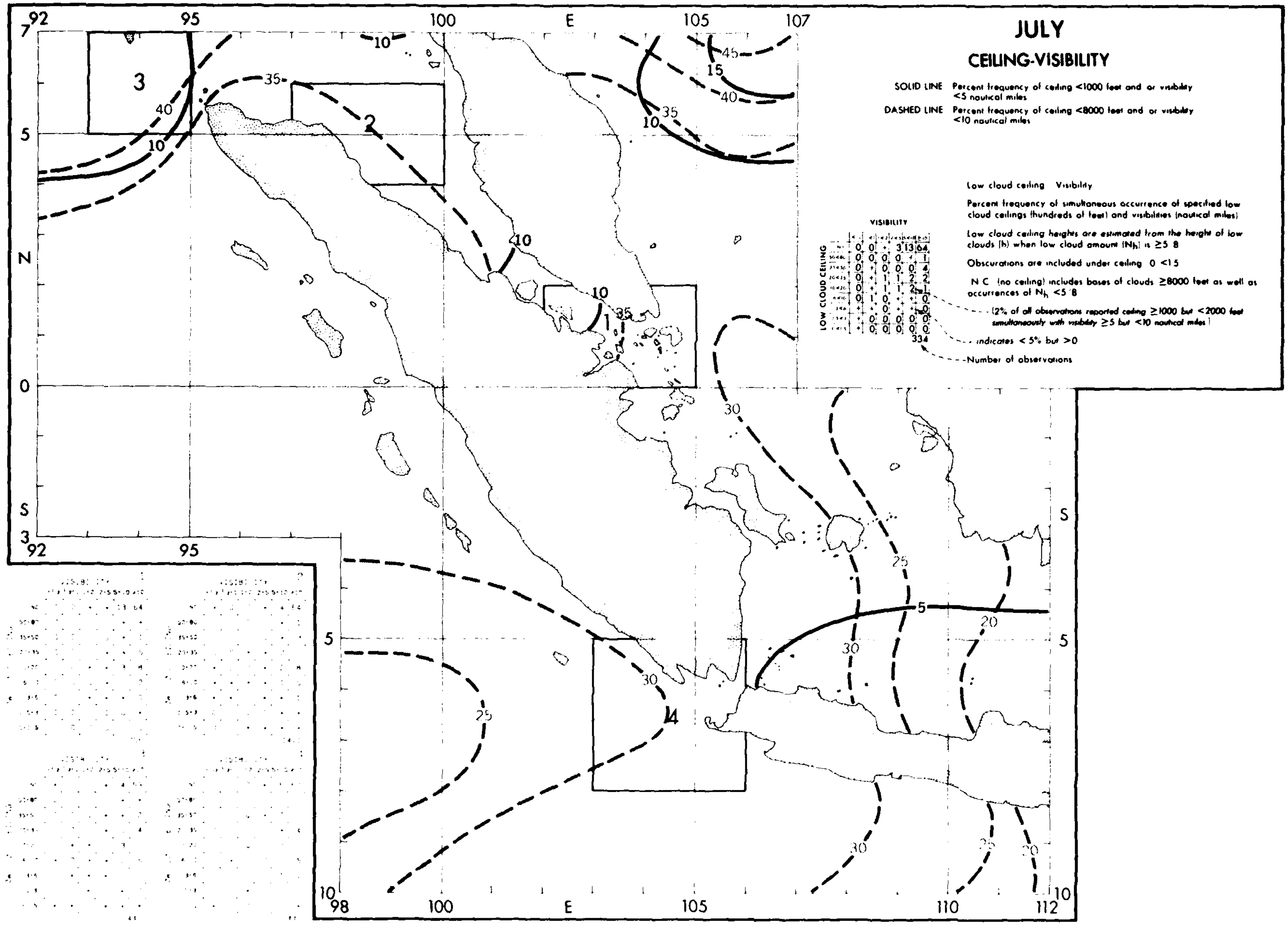

JUNE
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
5
10
S


JULY
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2 8
DASHED LINE Percent frequency of low cloud amount ≥5 8
Total Cloud Amount
Low Cloud Amount
CLOUD AMOUNT IN EIGHTHS
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8)
(46% of all low cloud amounts were ≤2/8)
Low cloud amount Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8 Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10

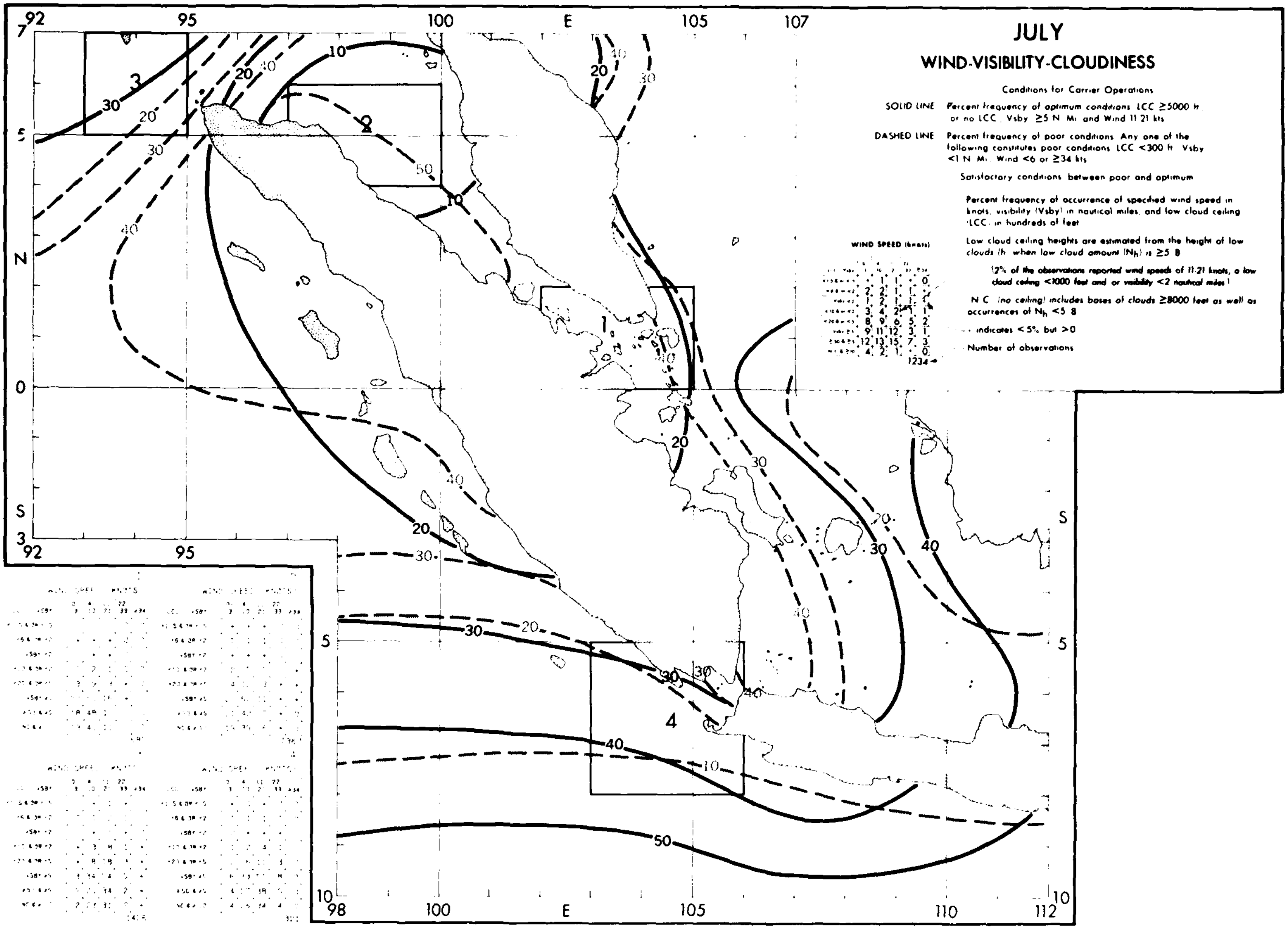

JULY
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation, subdivided into liquid type (including freezing rain and freezing drizzle) and snow
Pcpn Liquid Snow
Percentage of present weather observations reporting precipitation
Number of observations
(34% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10 30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
1587
31%
N NE E SE S SW W NW C
>5
10
15
5
1
2
3
4
92
95
100
105
107
110
112
98
E
N
S
0

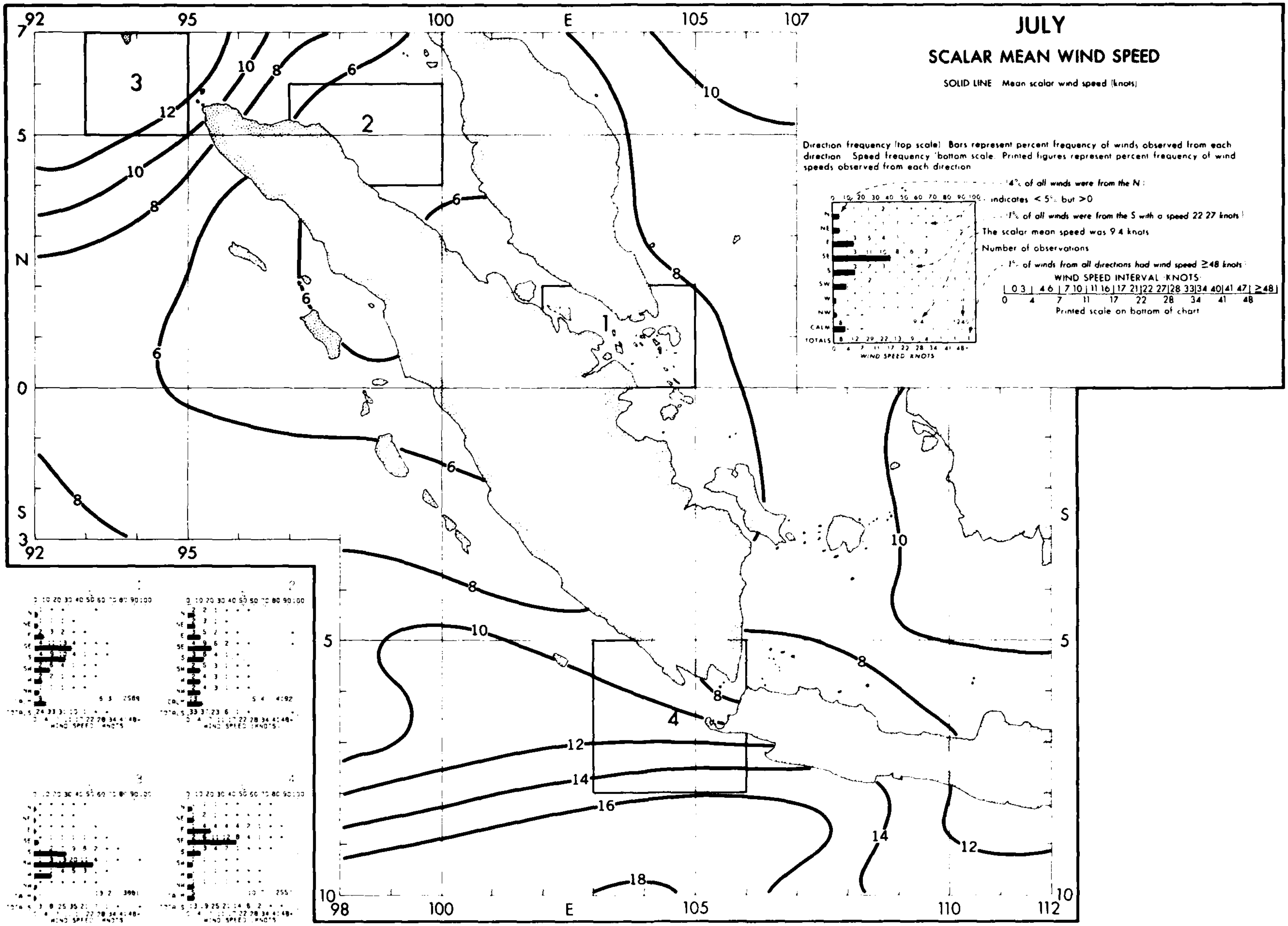

JULY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1

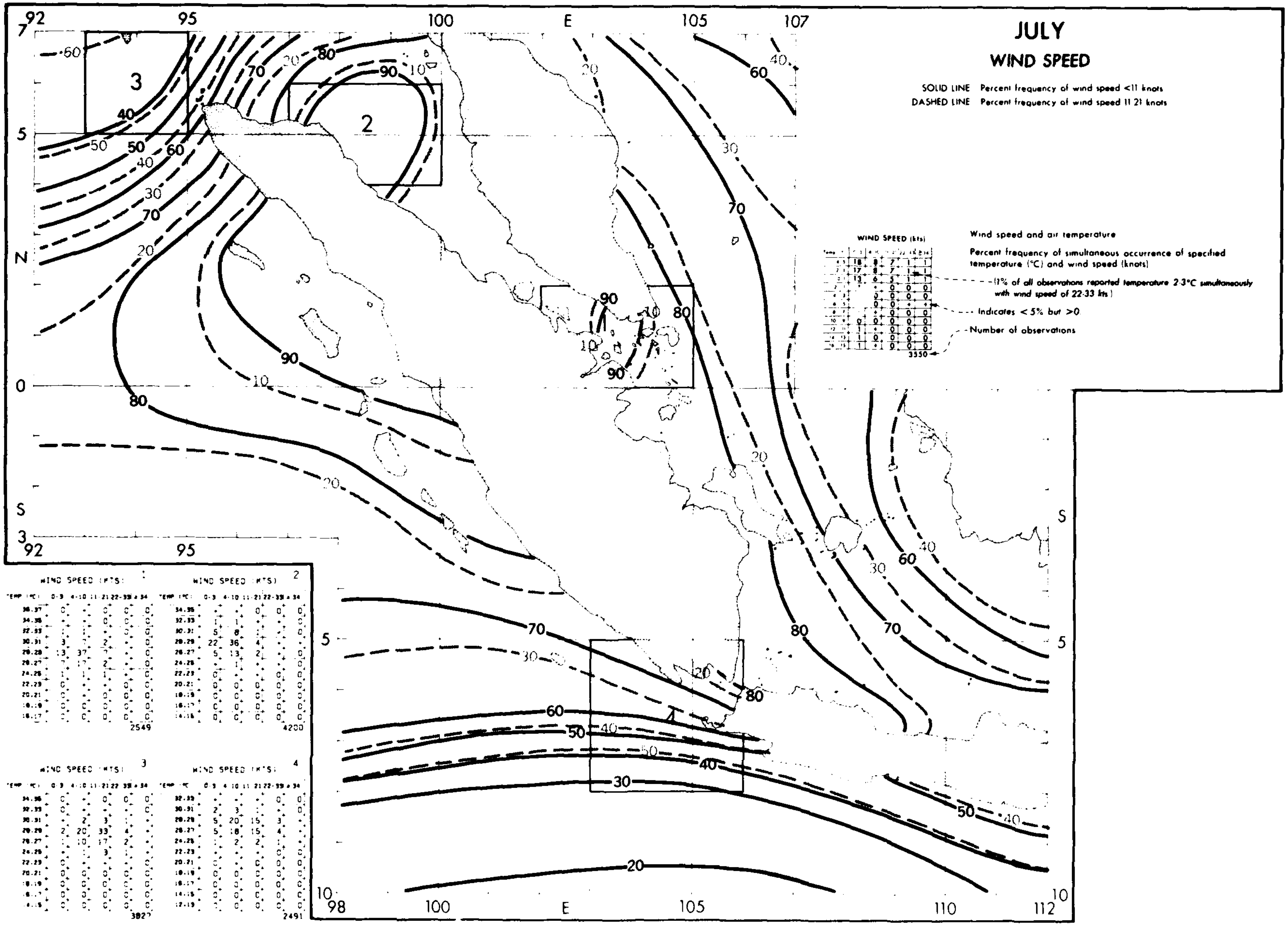

JULY
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10



JULY
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
Obscurations are included under ceiling 0 <15
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles)
indicates < 5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
92
95
100
E
105
107
98
110
112
7
5
N
0
S
3
10


JULY
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft or no LCC, Vsby ≥5 N Mi and Wind 11-21 kts
DASHED LINE Percent frequency of poor conditions Any one of the following constitutes poor conditions LCC <300 ft Vsby <1 N Mi Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles, and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5/8
(2% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and/or visibility <2 nautical miles)
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5/8
indicates <5% but >0
Number of observations
WIND SPEED (knots)
1234
92
95
100
105
107
110
112
98
E
N
0
S
5
10
7
3


JULY
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots)
Direction frequency (top scale) Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale) Printed figures represent percent frequency of wind speeds observed from each direction
14% of all winds were from the N
indicates < 5% but > 0
1% of all winds were from the S with a speed 22 27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥48 knots
WIND SPEED INTERVAL (KNOTS)
0 3 | 4 6 | 7 10 | 11 16 | 17 21 | 22 27 | 28 33 | 34 40 | 41 47 | ≥48
0 4 7 11 17 22 28 34 41 48
Printed scale on bottom of chart
WIND SPEED KNOTS
1
2
3
4
E
N
S
92
95
100
105
107
110
112
98



WIND SPEED (KTS) 1

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
36-37	0	•	0	0	0
34-35	•	•	0	0	0
32-33	1	1	•	0	0
30-31	3	7	2	•	0
28-29	13	37	7	•	0
26-27	7	17	2	•	0
24-25	1	1	1	•	0
22-23	0	•	•	0	0
20-21	0	•	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0

2549

WIND SPEED (KTS) 2

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	•	•	0	0	0
32-33	1	1	•	•	0
30-31	5	8	1	•	0
28-29	22	36	4	•	•
26-27	5	13	2	•	0
24-25	•	1	•	•	0
22-23	0	•	•	0	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

4200

WIND SPEED (KTS) 3

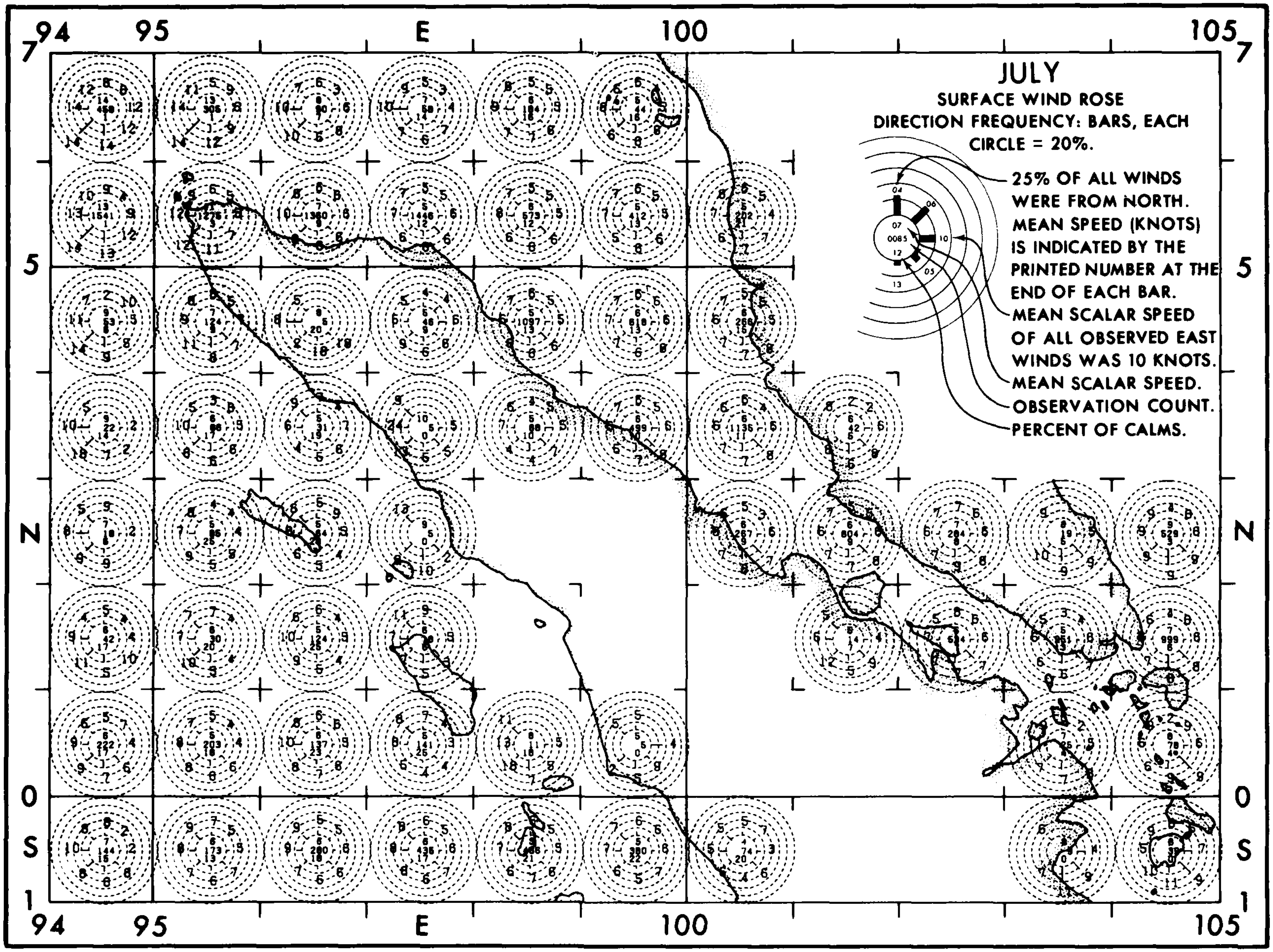
TEMP (°C)	0-3	4-10	11-21	22-33	≥34
34-35	0	•	0	0	0
32-33	0	•	•	•	0
30-31	•	2	3	1	•
28-29	2	20	33	4	•
26-27	1	10	17	2	•
24-25	•	1	3	1	•
22-23	0	•	•	•	0
20-21	0	0	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0

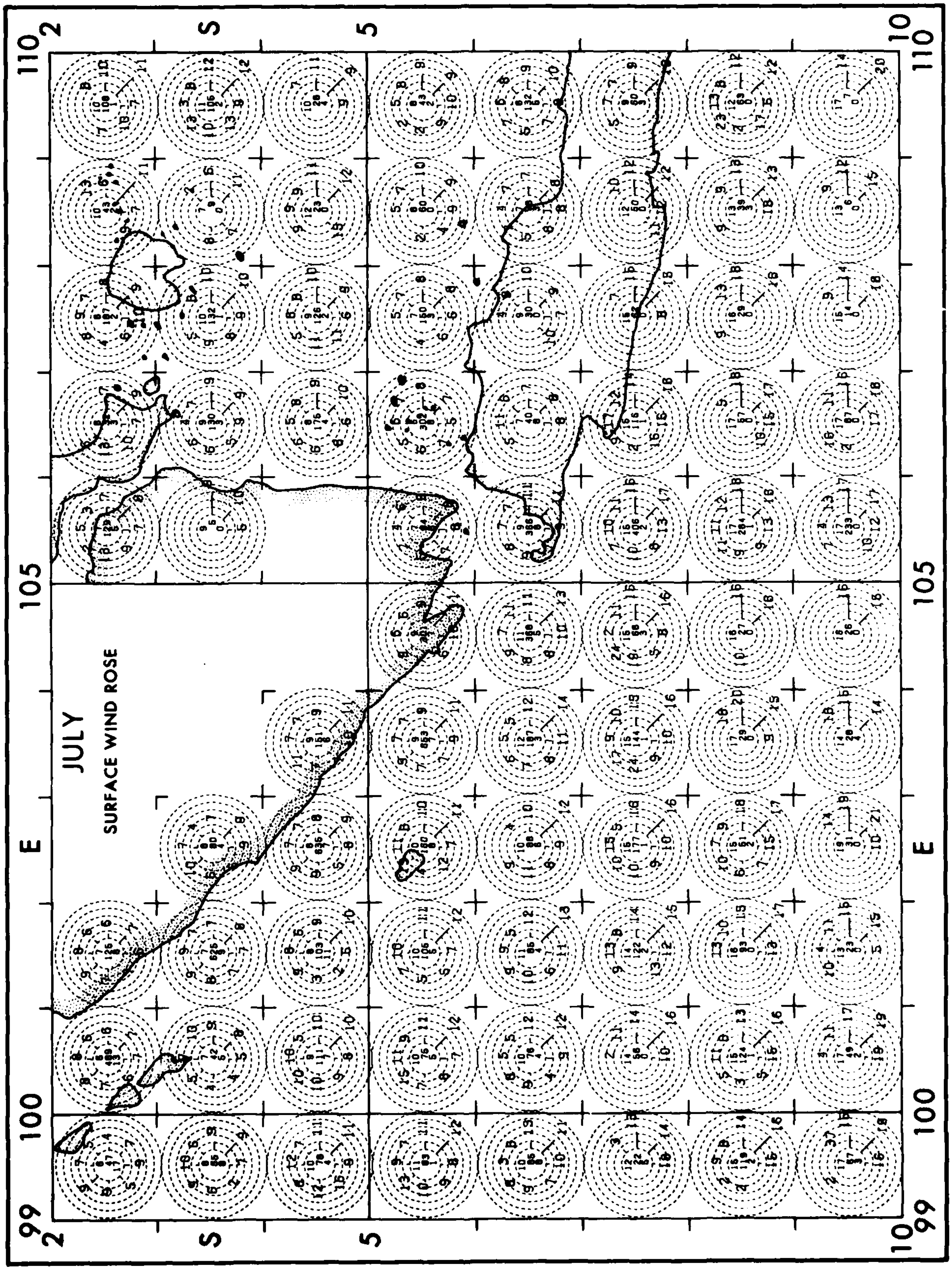
3827

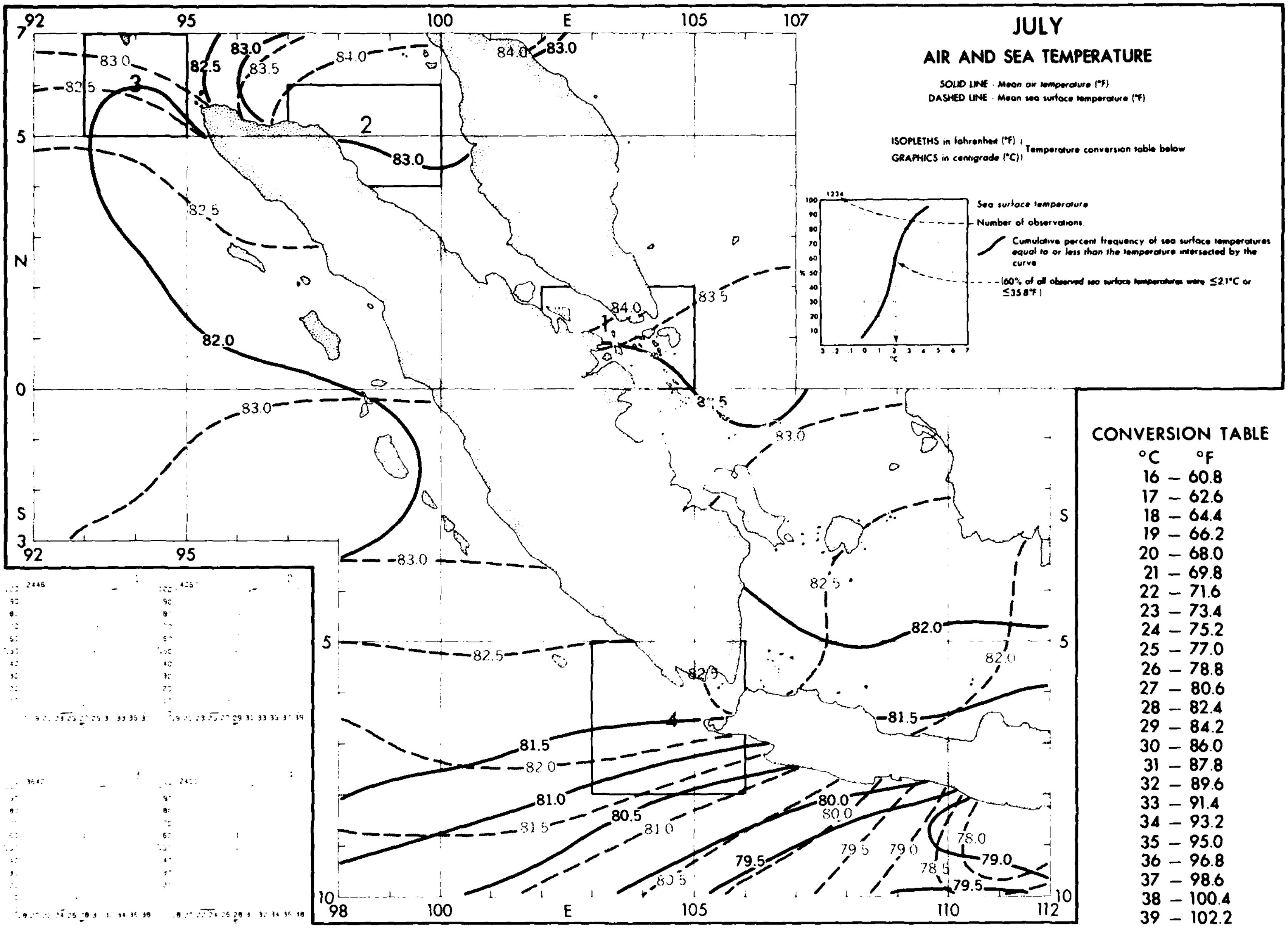
WIND SPEED (KTS) 4

TEMP (°C)	0-3	4-10	11-21	22-33	≥34
32-33	•	•	•	0	0
30-31	2	3	1	•	0
28-29	5	20	15	3	•
26-27	5	18	15	4	•
24-25	1	2	2	1	•
22-23	•	•	•	0	0
20-21	0	•	0	0	0
18-19	0	0	0	0	0
16-17	0	0	0	0	0
14-15	0	0	0	0	0
12-13	[illegible]	0	0	0	0

2491

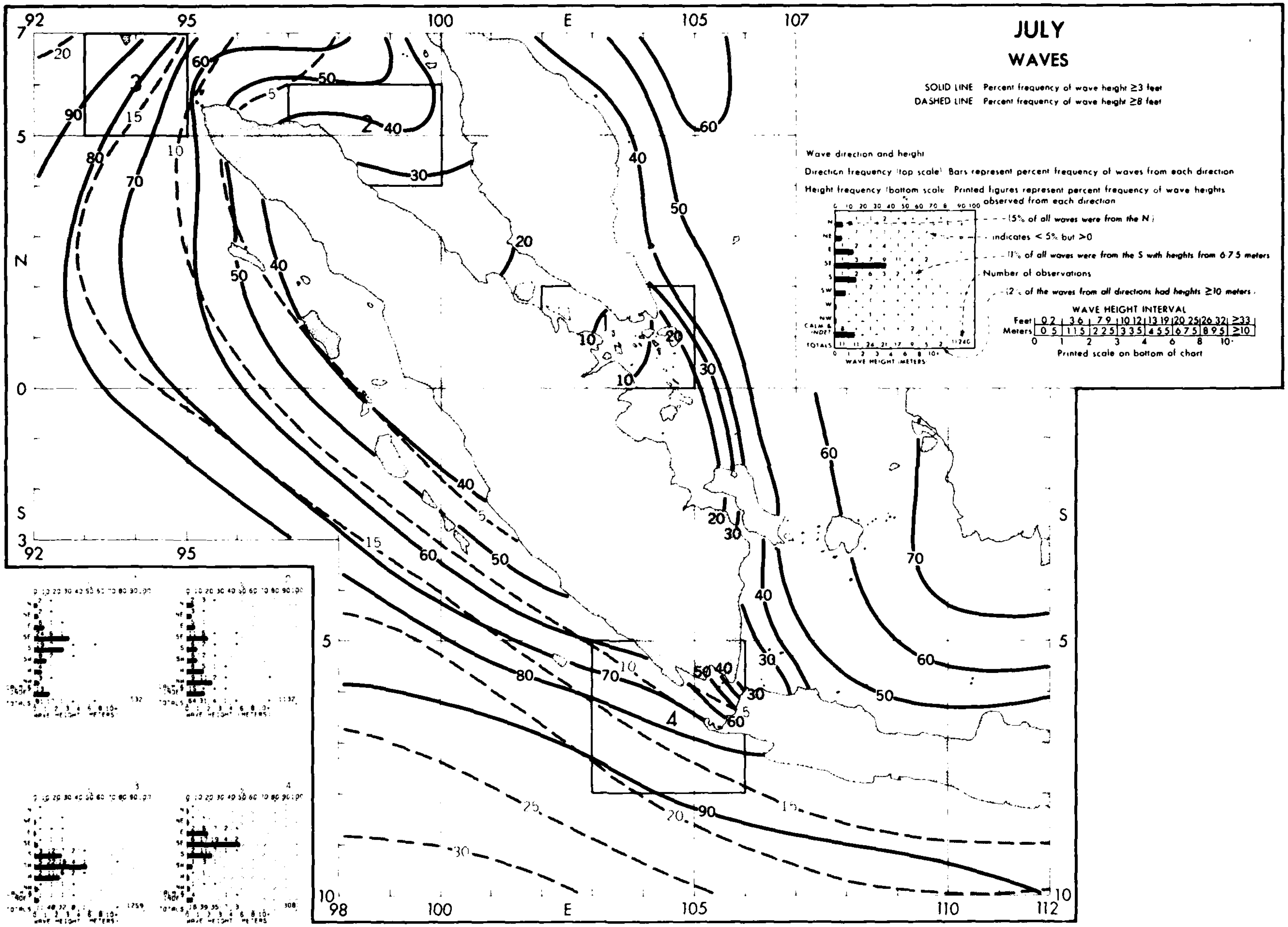

JULY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
E
100
105
7
5
N
0
S
1

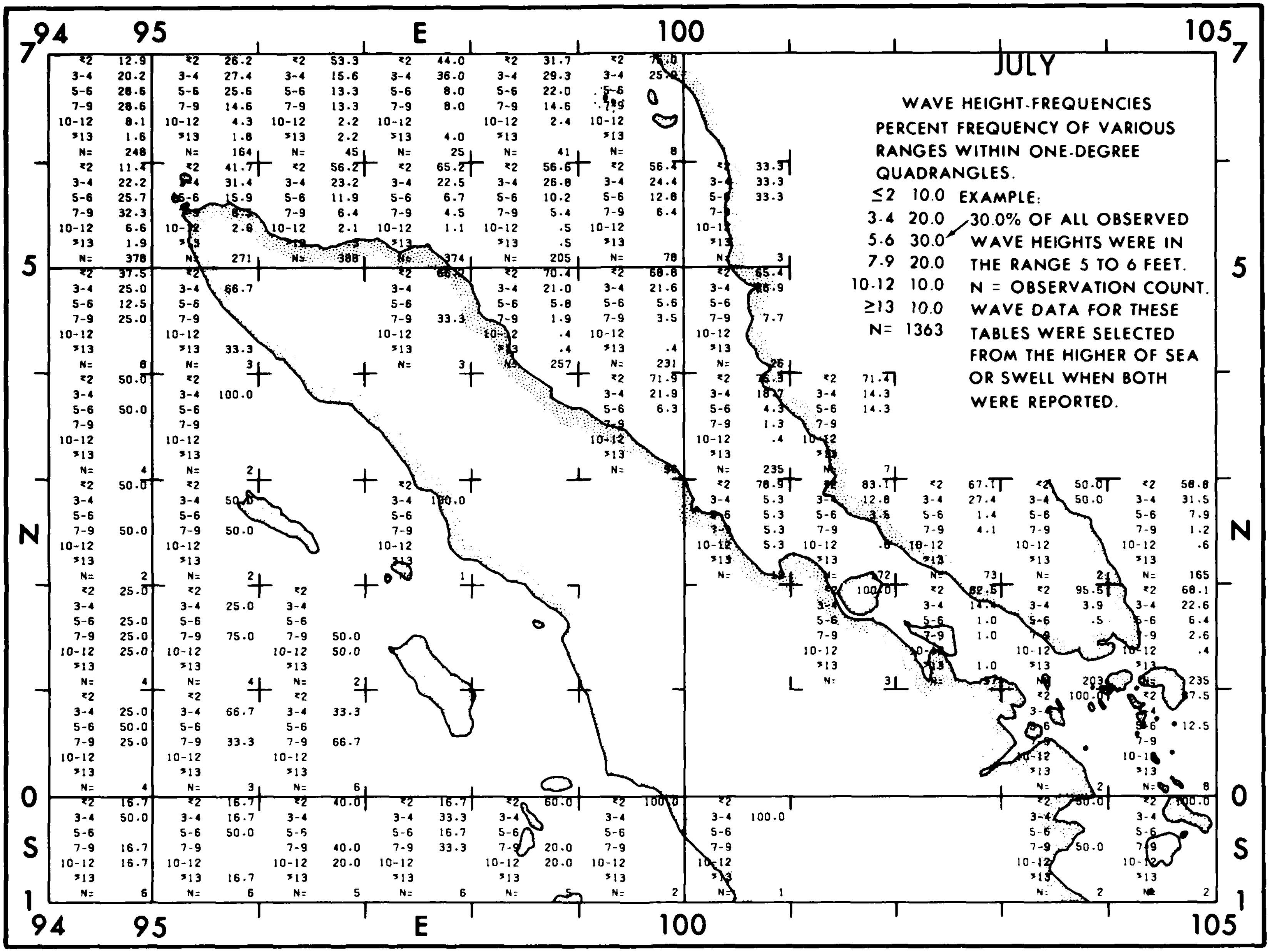

JULY
SURFACE WIND ROSE
99
100
105
110
2
5
10
E

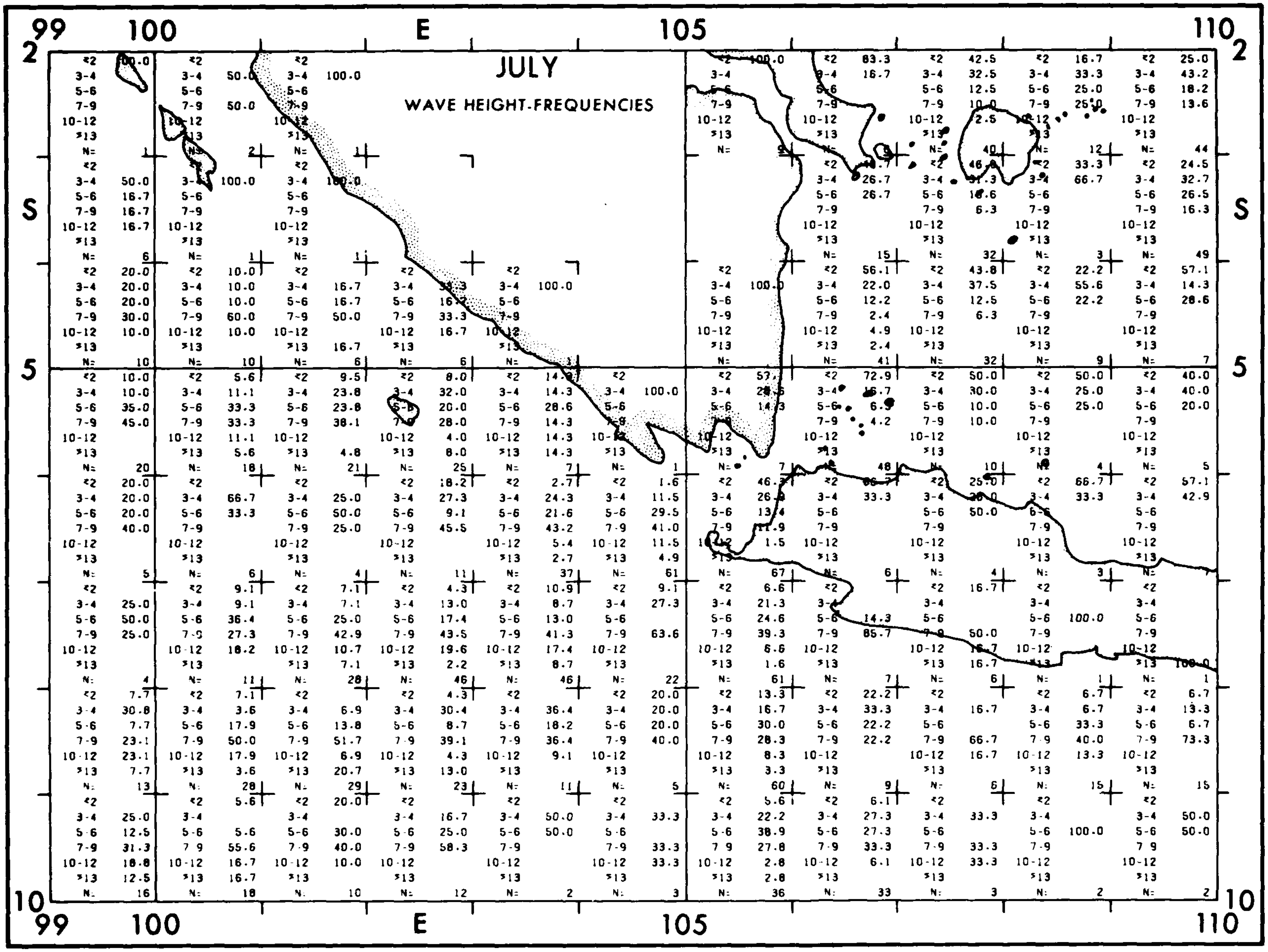


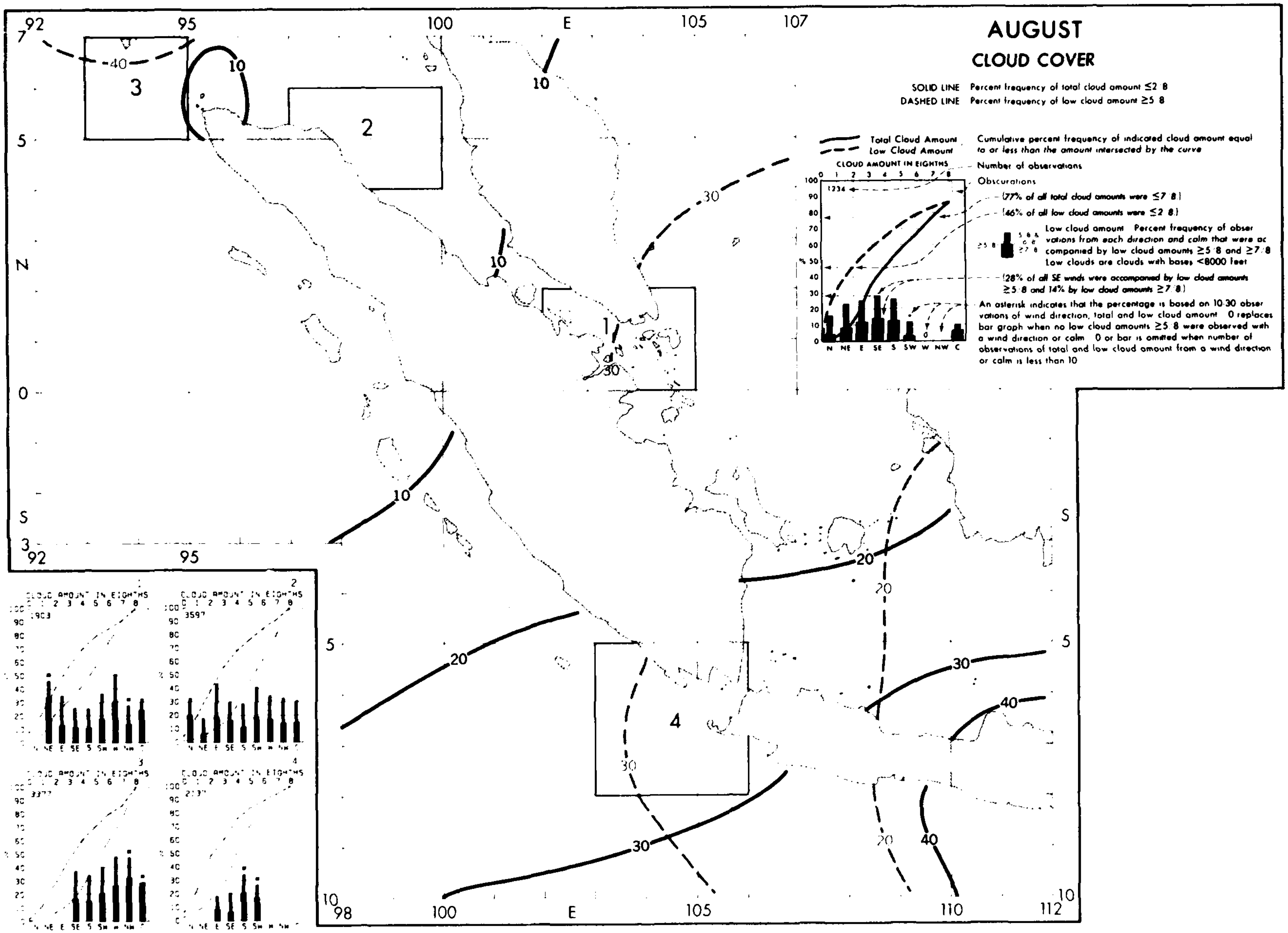
CONVERSION TABLE

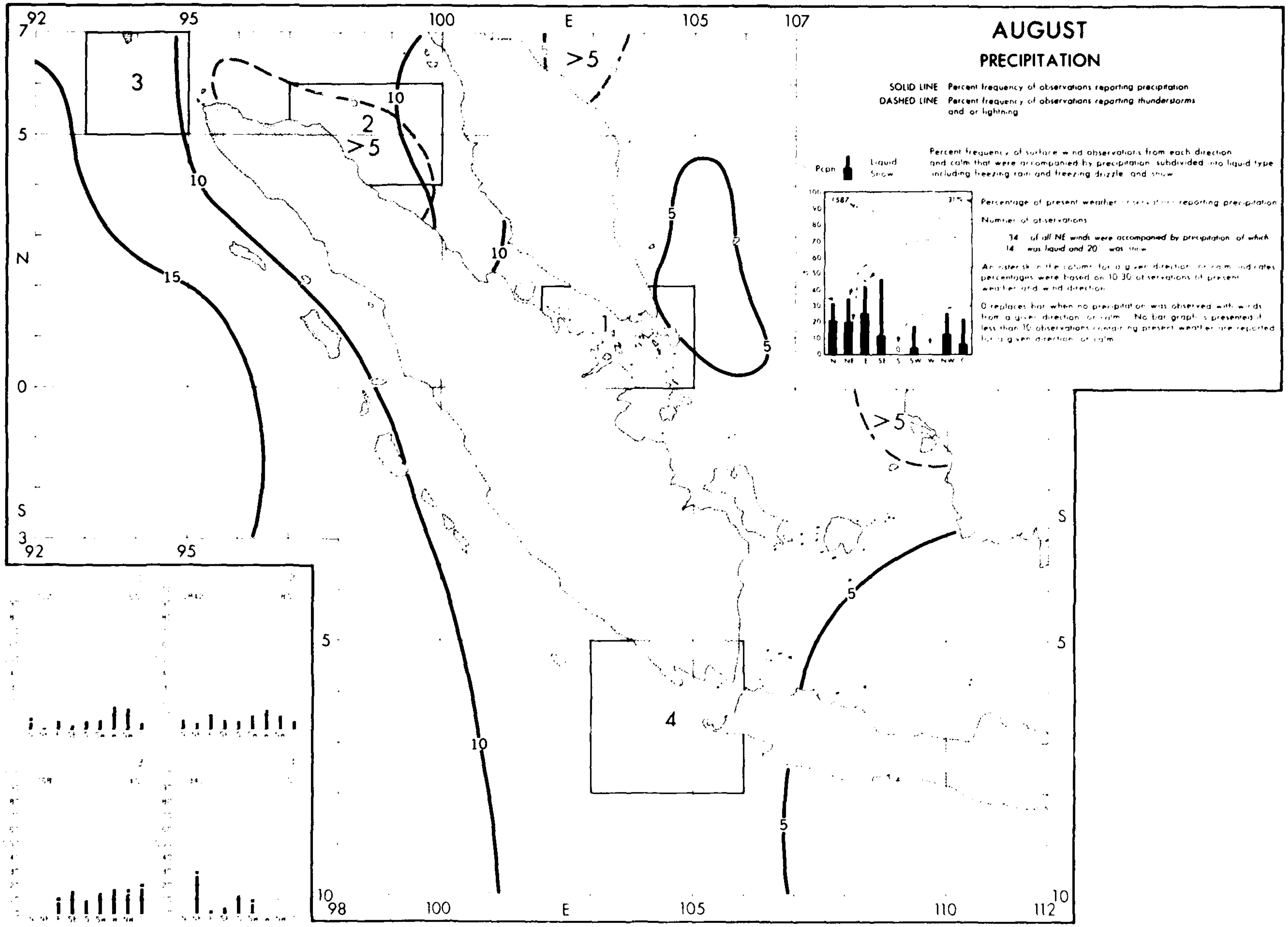
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2

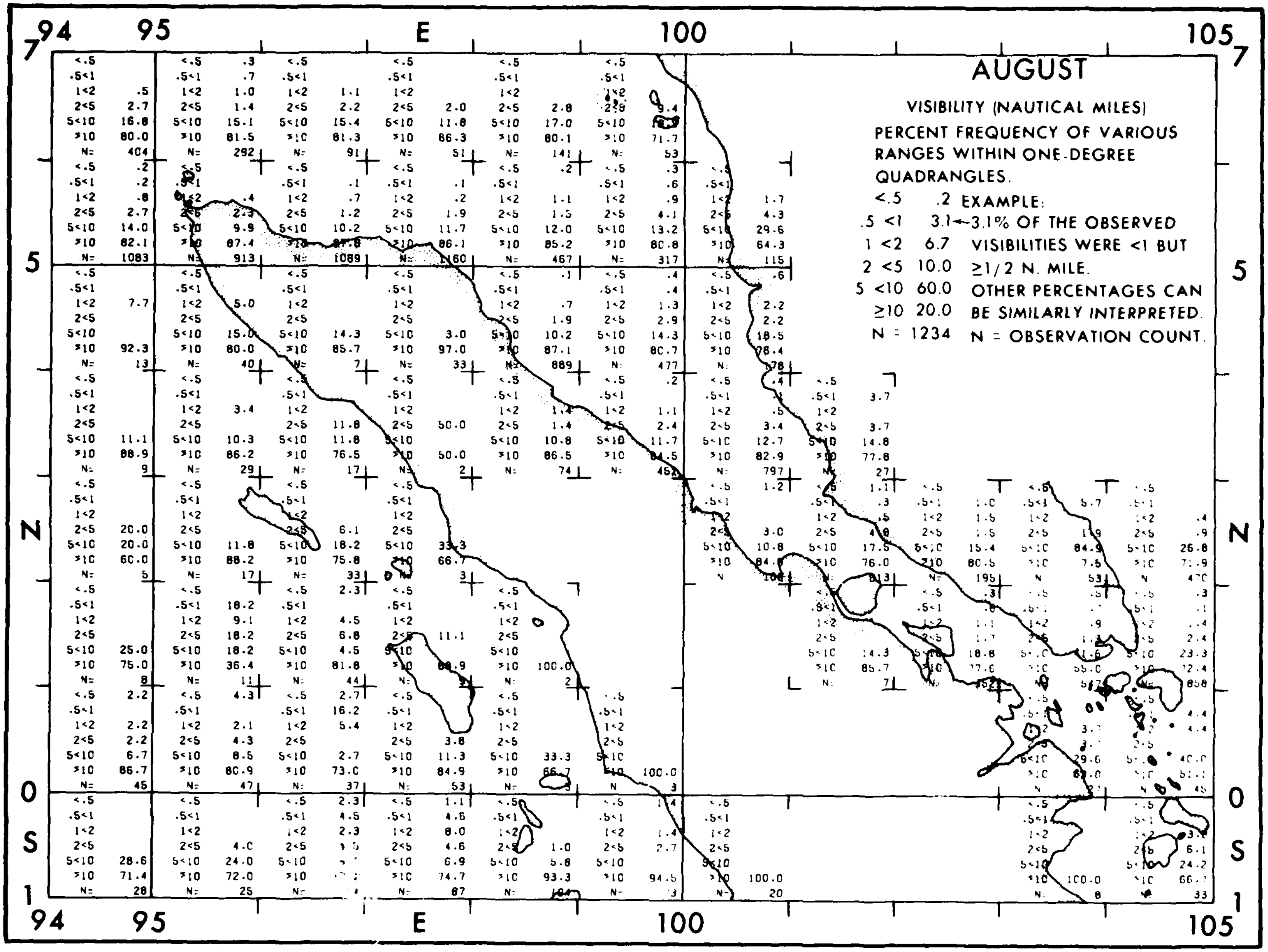

JULY
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency (top scale) Bars represent percent frequency of waves from each direction
Height frequency (bottom scale) Printed figures represent percent frequency of wave heights observed from each direction
15% of all waves were from the N
indicates < 5% but >0
11% of all waves were from the S with heights from 6-7.5 meters
Number of observations
2% of the waves from all directions had heights ≥10 meters
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-5.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
WAVE HEIGHT METERS

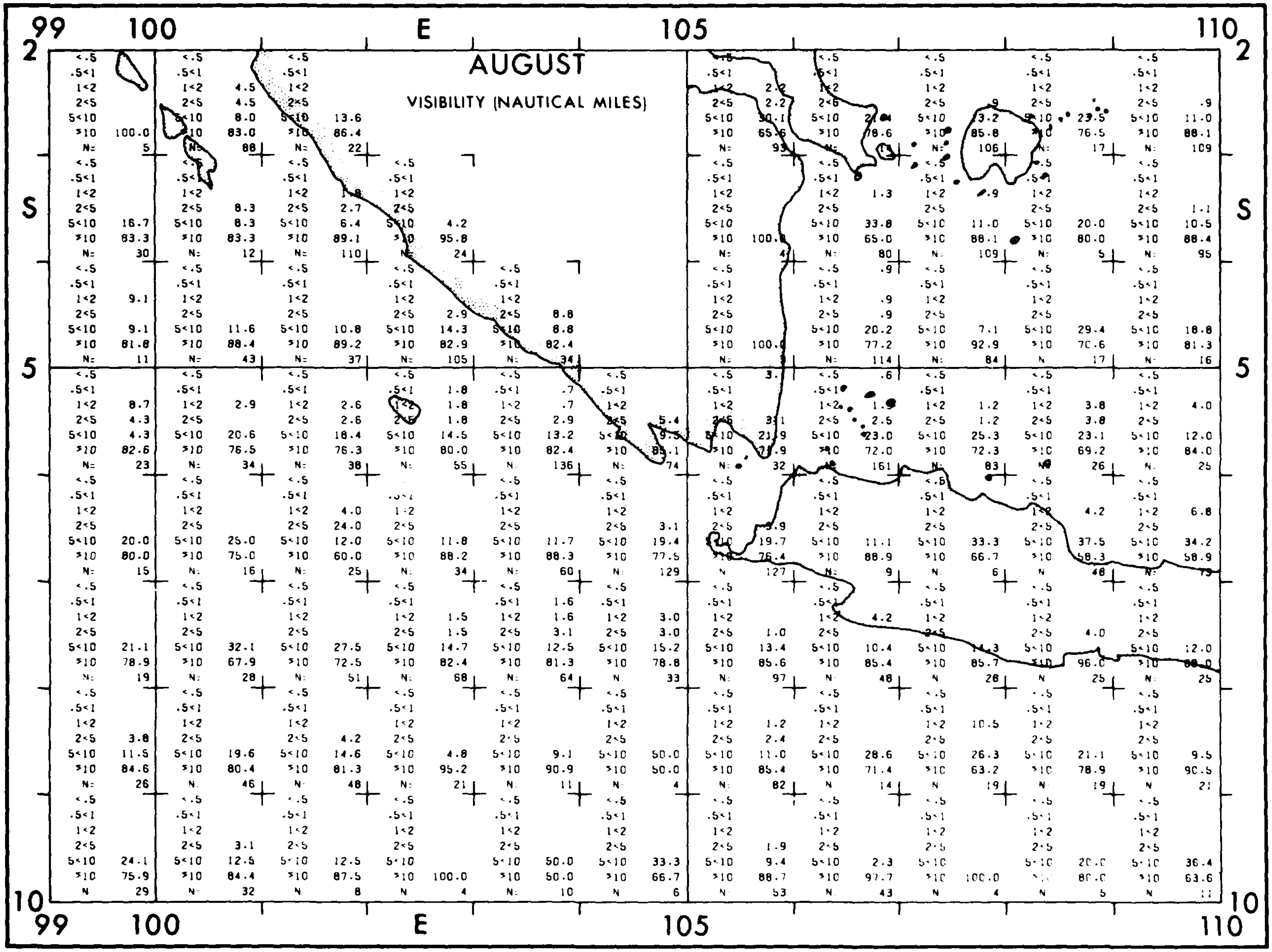

JULY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

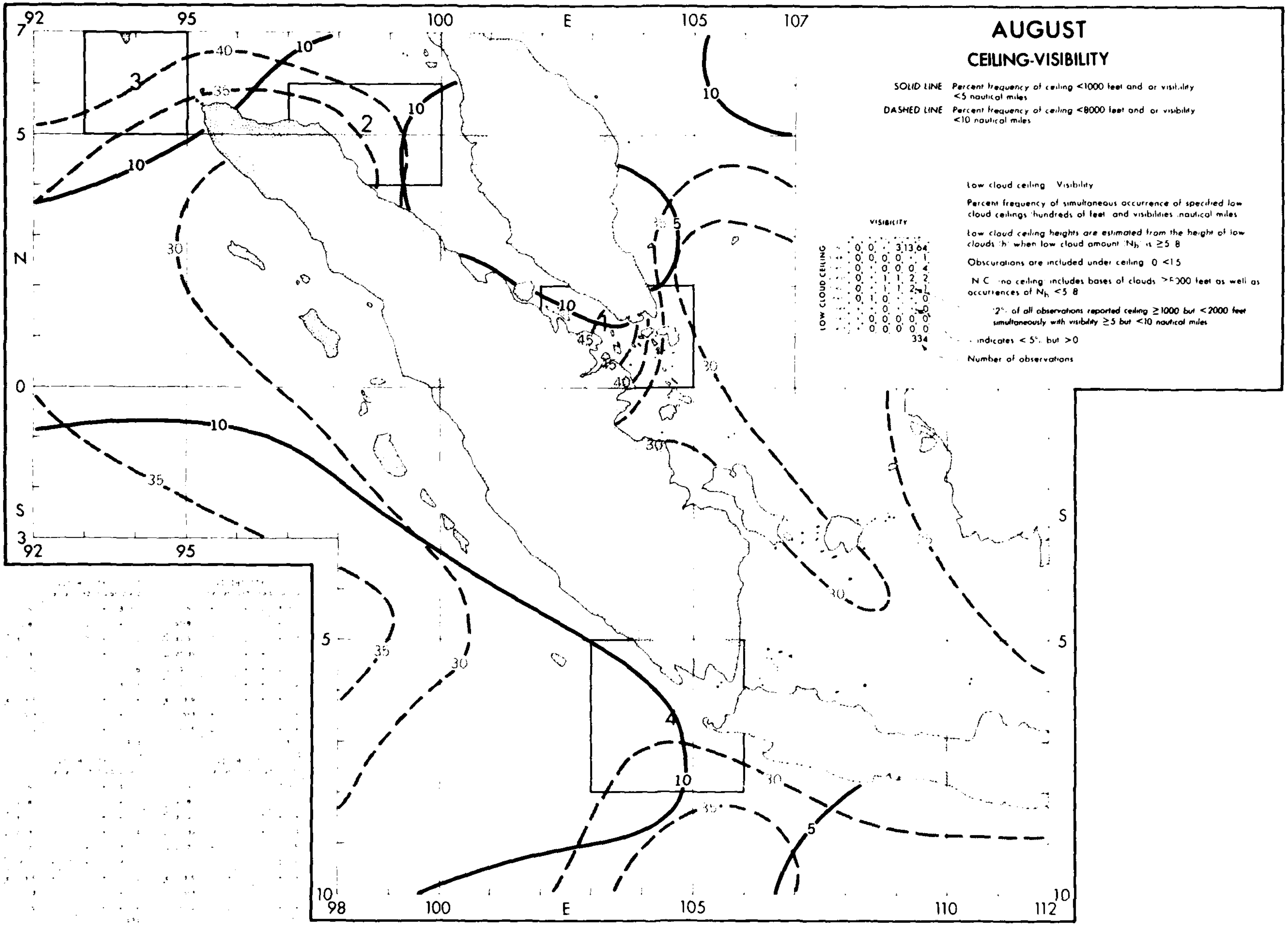

JULY
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10

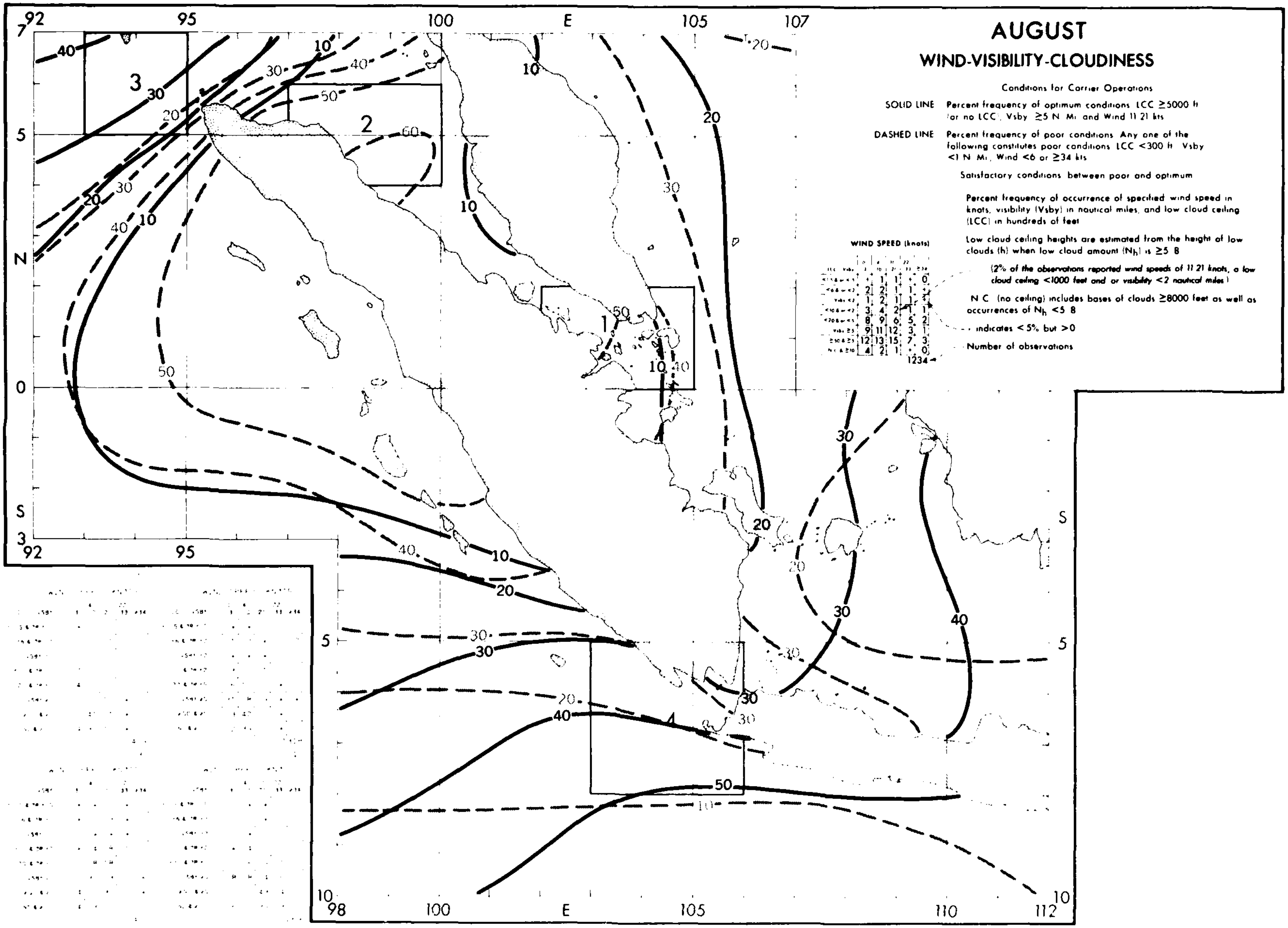

AUGUST
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2/8
DASHED LINE Percent frequency of low cloud amount ≥5/8
Total Cloud Amount
Low Cloud Amount
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
CLOUD AMOUNT IN EIGHTHS
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8)
(46% of all low cloud amounts were ≤2/8)
Low cloud amount. Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
N NE E SE S SW W NW C
1
2
3
4
CLOUD AMOUNT IN EIGHTHS
N
S
E
92
95
100
105
107
98
110
112

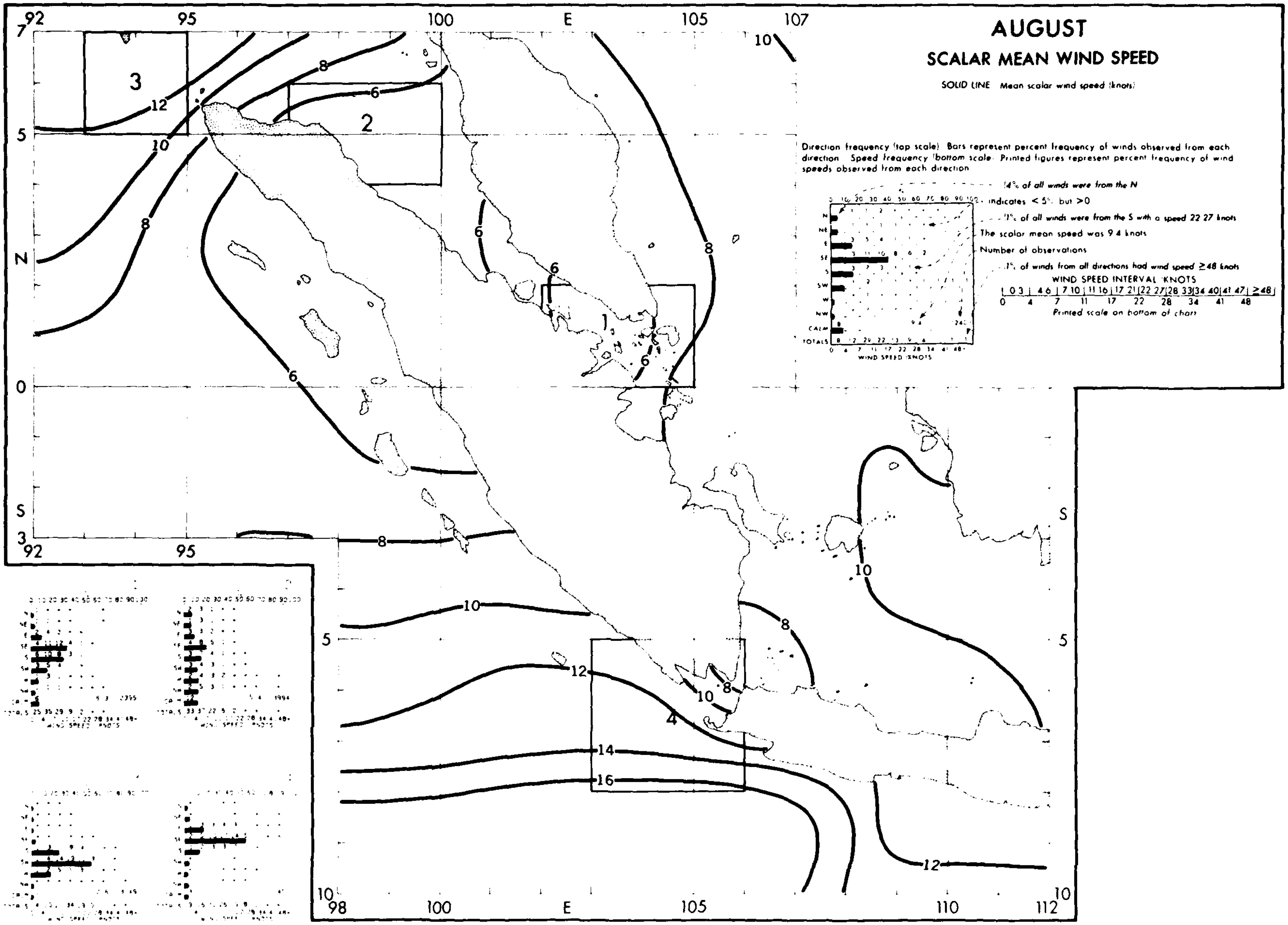

AUGUST
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Pcpn Liquid Snow
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation subdivided into liquid type including freezing rain and freezing drizzle and snow
Percentage of present weather observations reporting precipitation
Number of observations
34 of all NE winds were accompanied by precipitation of which 14 was liquid and 20 was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10-30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
AUGUST
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10
15
2
>5
1
3
4

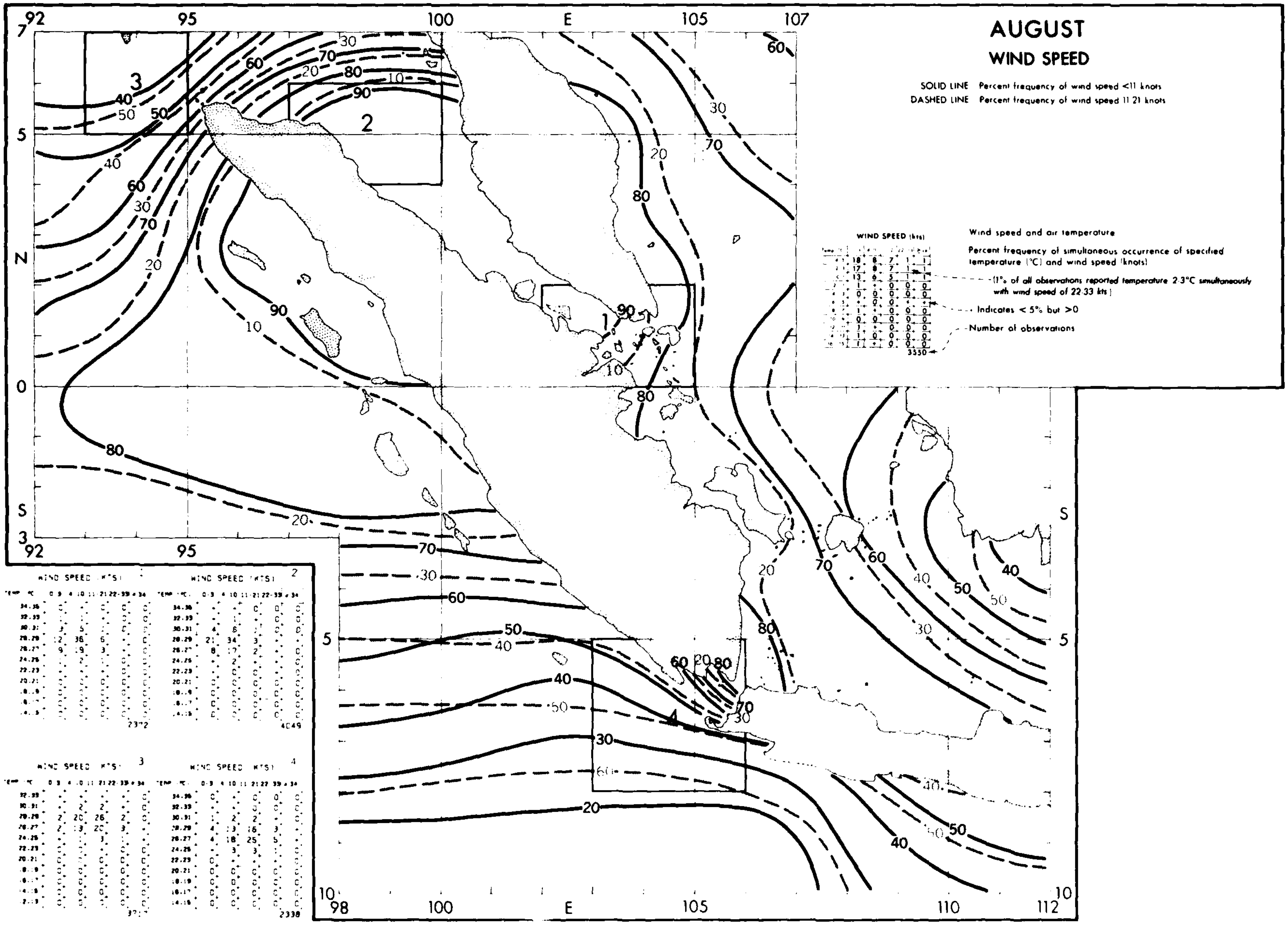

AUGUST
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1


AUGUST
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10

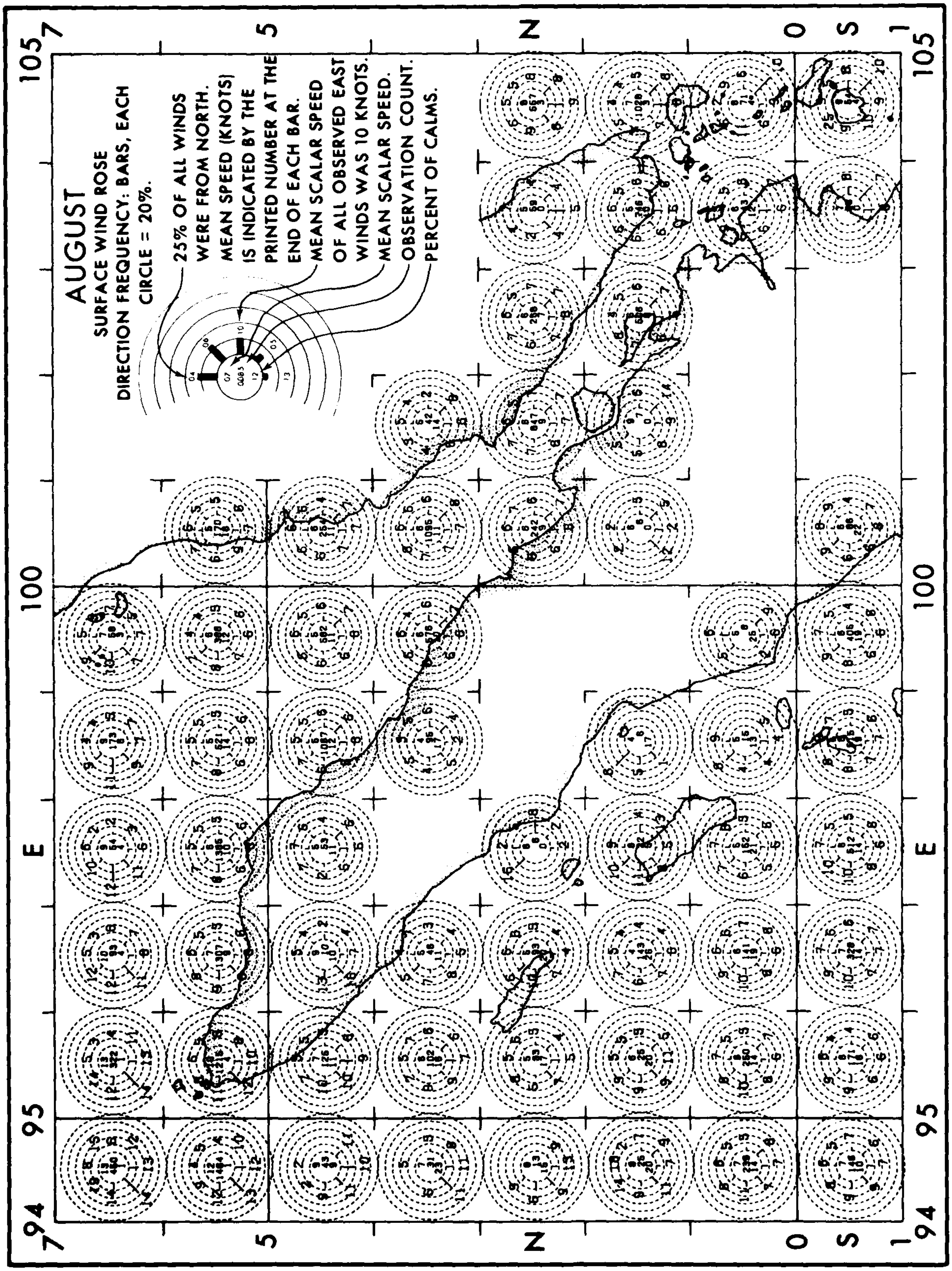

AUGUST
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
Obscurations are included under ceiling 0 <1.5
N C (no ceiling) includes bases of clouds >5000 feet as well as occurrences of Nh <5 8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles
· indicates <5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10

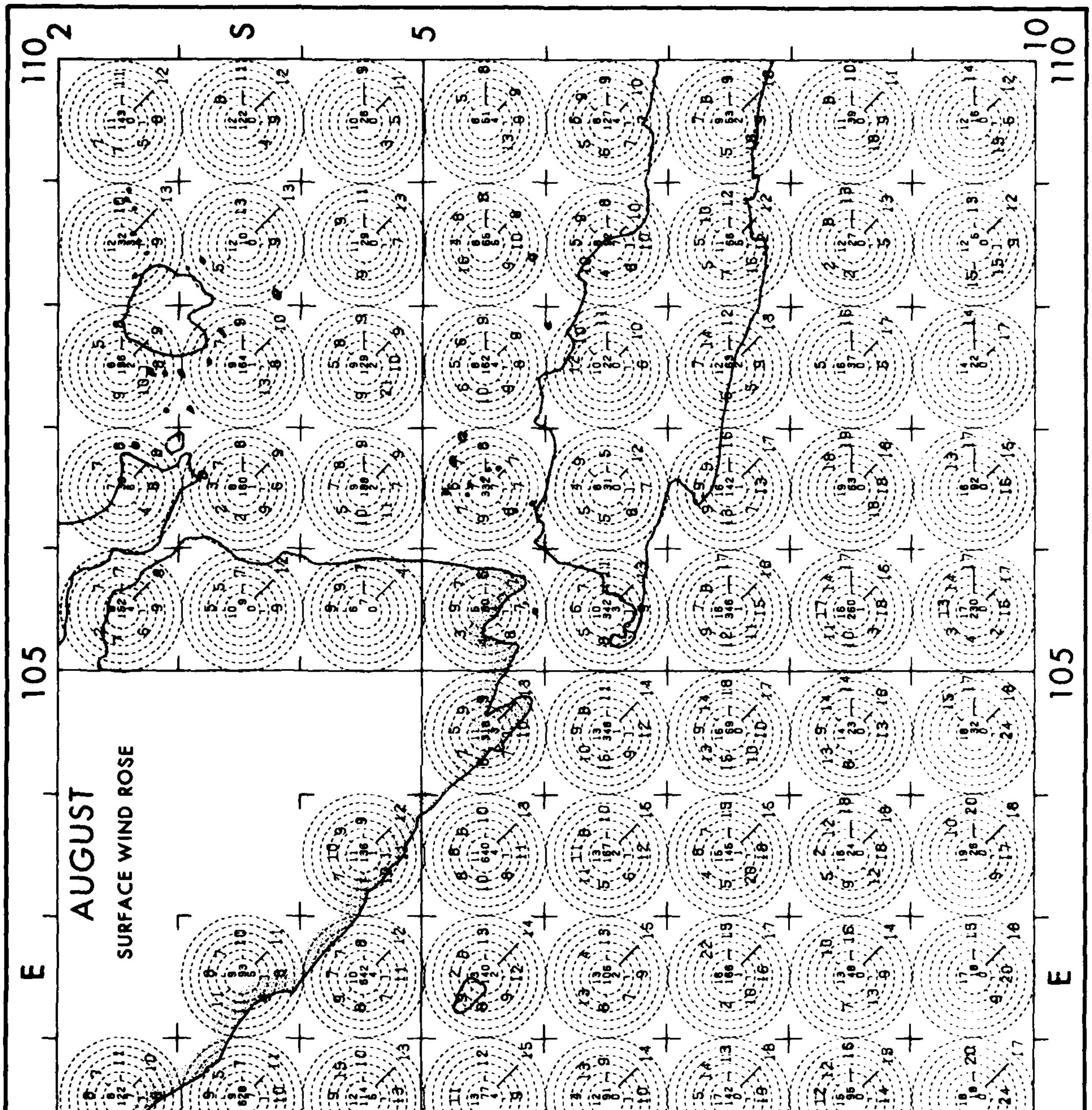

AUGUST
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft (or no LCC), Vsby ≥5 N Mi and Wind 11 21 kts
DASHED LINE Percent frequency of poor conditions Any one of the following constitutes poor conditions LCC <300 ft Vsby <1 N Mi, Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles, and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
(2% of the observations reported wind speeds of 11 21 knots, a low cloud ceiling <1000 feet and or visibility <2 nautical miles)
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
indicates <5% but >0
Number of observations
WIND SPEED (knots)
1234
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10
1
2
3
4


AUGUST
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots)
Direction frequency (top scale) Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale) Printed figures represent percent frequency of wind speeds observed from each direction
14% of all winds were from the N
indicates < 5% but > 0
11% of all winds were from the S with a speed 22-27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥ 48 knots
WIND SPEED INTERVAL KNOTS
0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 22-27 | 28-33 | 34-40 | 41-47 | ≥48
0 4 7 11 17 22 28 34 41 48
Printed scale on bottom of chart
WIND SPEED KNOTS
TOTALS
CALM
N
NE
E
SE
S
SW
W
NW
92
95
100
105
107
98
110
112
E
N
S
0
5
7
3
10
1
2
3
4
6
8
10
12
14
16



AUGUST
WIND SPEED
SOLID LINE Percent frequency of wind speed <11 knots
DASHED LINE Percent frequency of wind speed 11-21 knots
Wind speed and air temperature
Percent frequency of simultaneous occurrence of specified temperature (°C) and wind speed (knots)
(1% of all observations reported temperature 2-3°C simultaneously with wind speed of 22-33 kts)
Indicates < 5% but >0
Number of observations
WIND SPEED (kts)


AUGUST
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
105
100
95
94
E
N
S
0
5
7
1

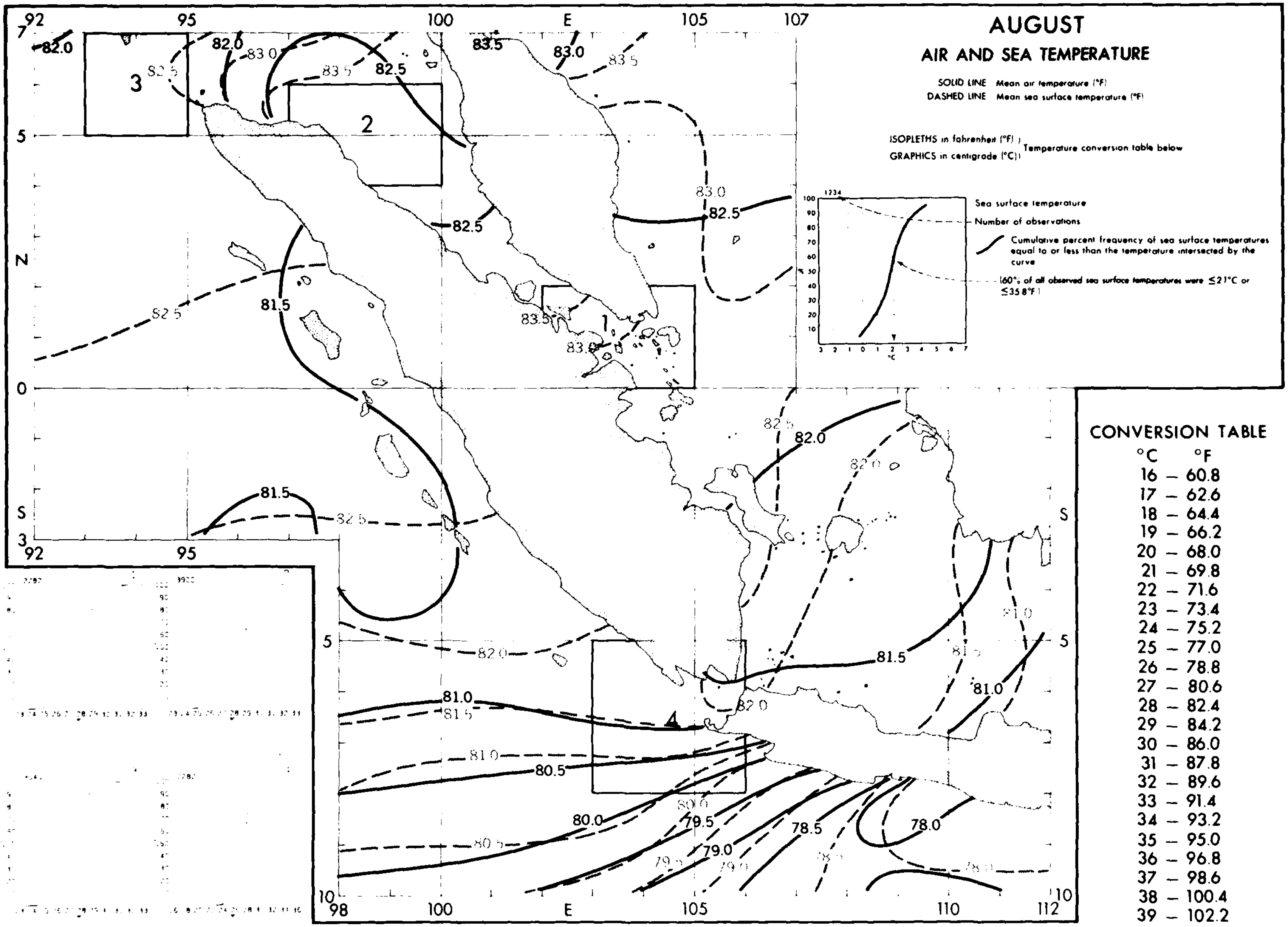

AUGUST
SURFACE WIND ROSE
99
100
105
110
E

AUGUST

AIR AND SEA TEMPERATURE

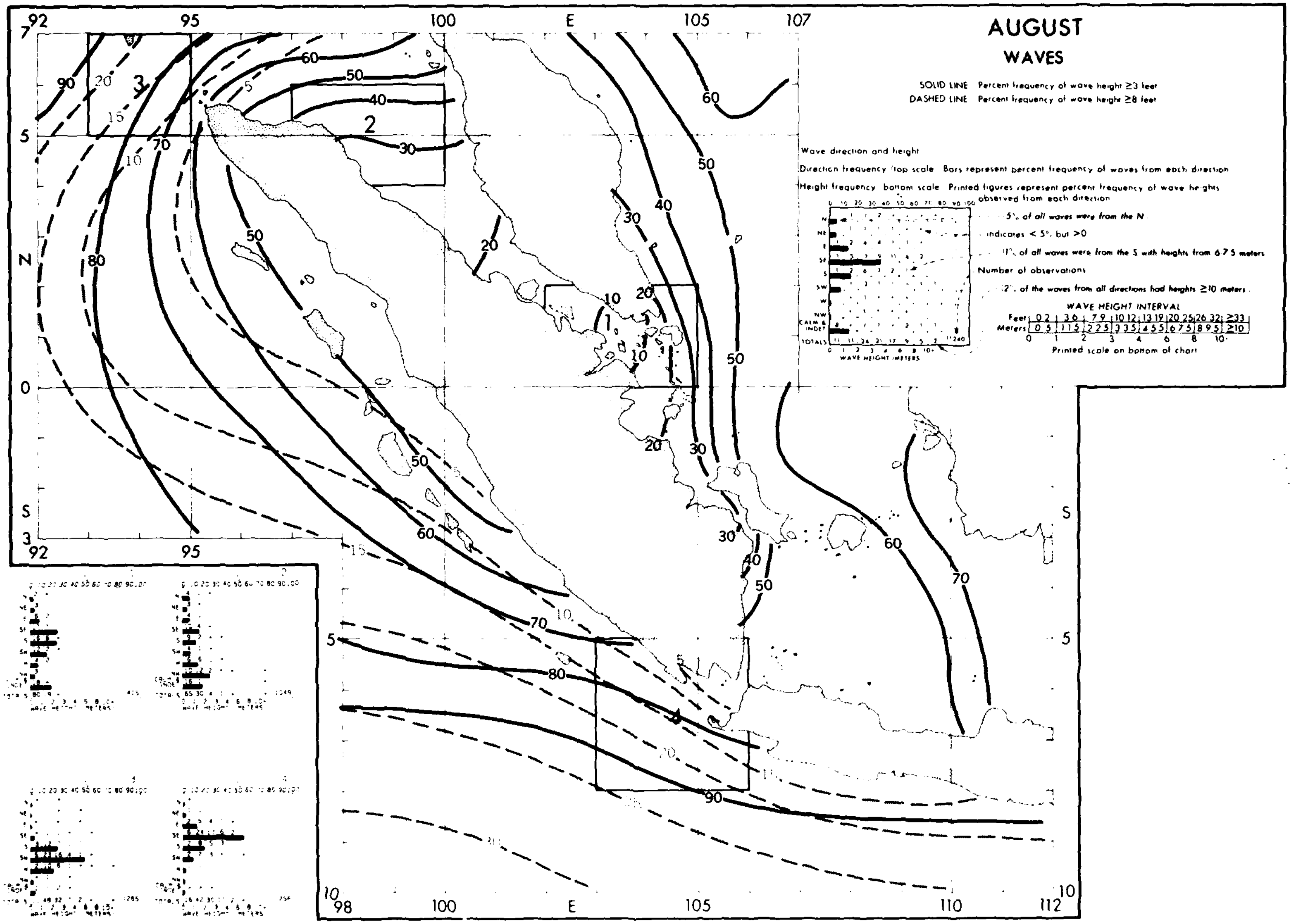
SOLID LINE Mean air temperature (°F)
DASHED LINE Mean sea surface temperature (°F)

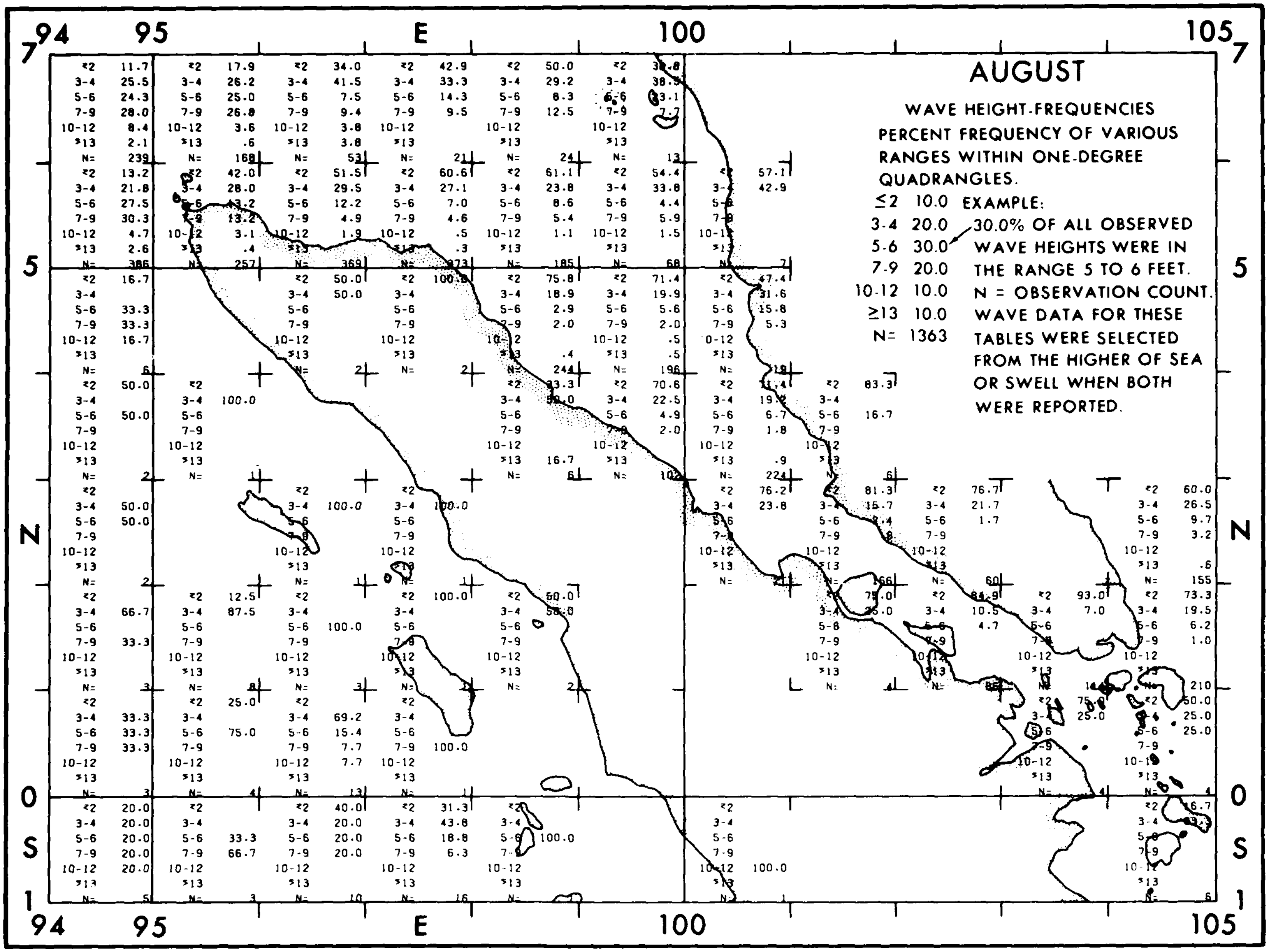
ISOPLETHS in fahrenheit (°F)
GRAPHICS in centigrade (°C) Temperature conversion table below

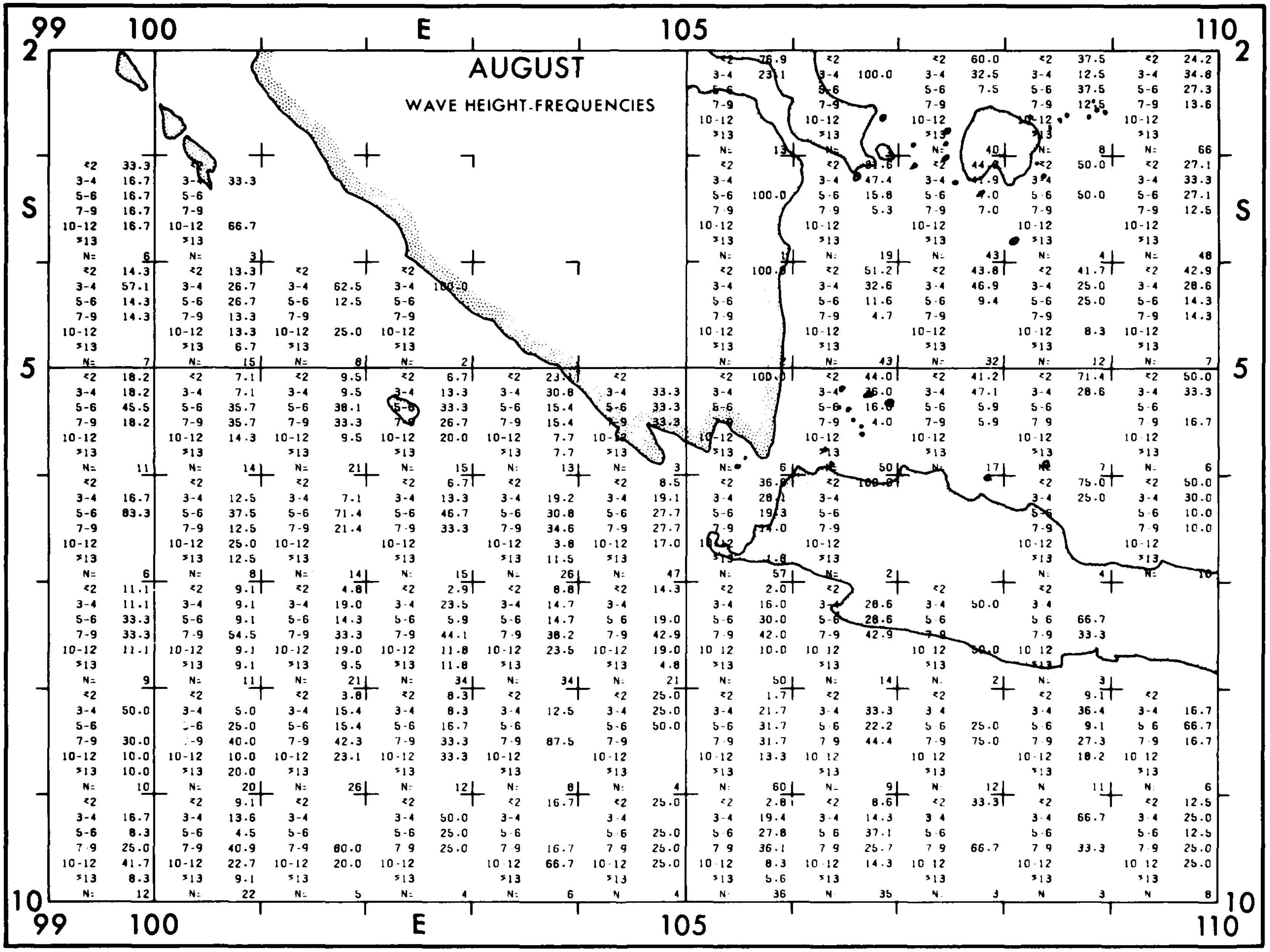


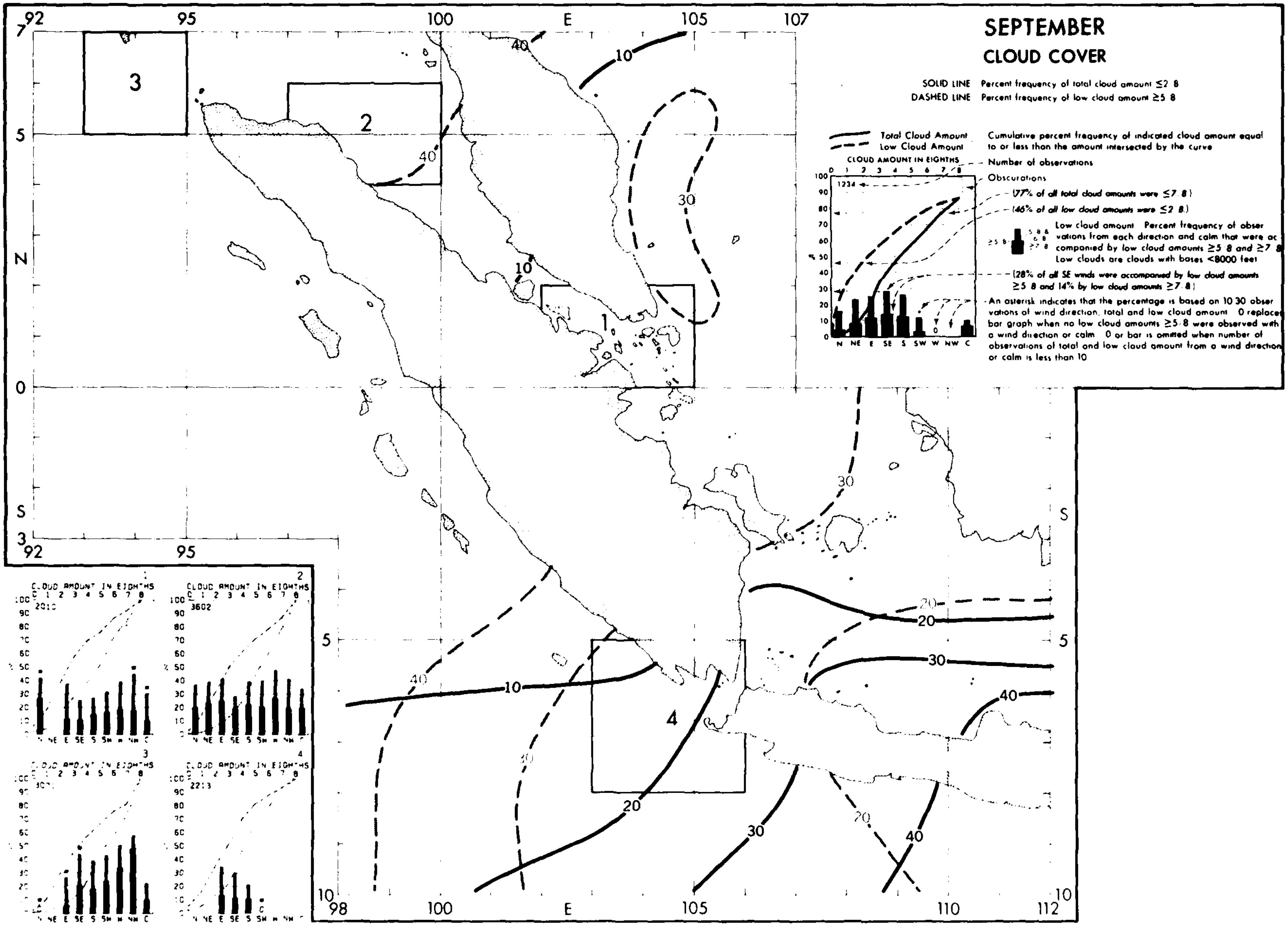
CONVERSION TABLE

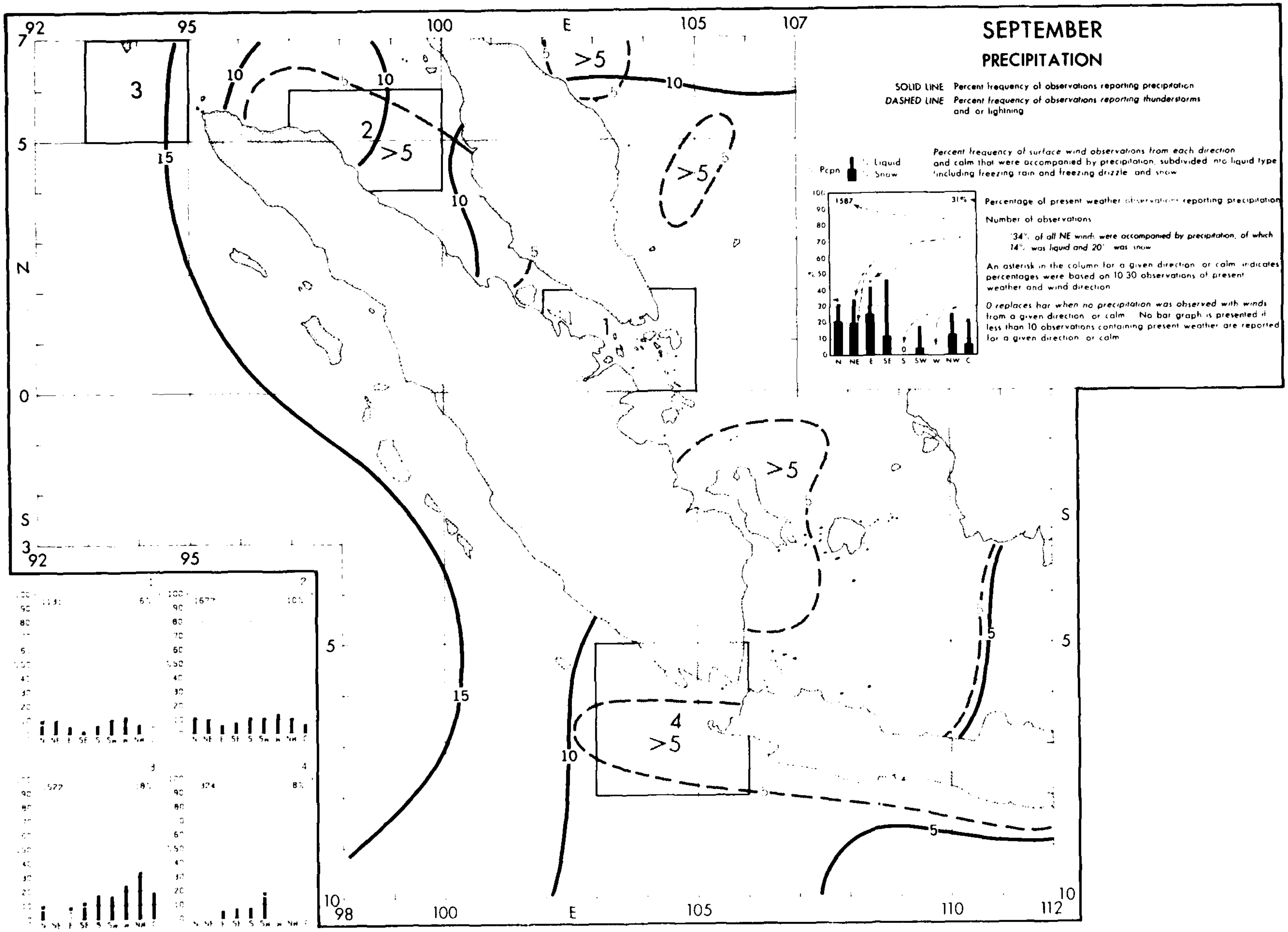
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2

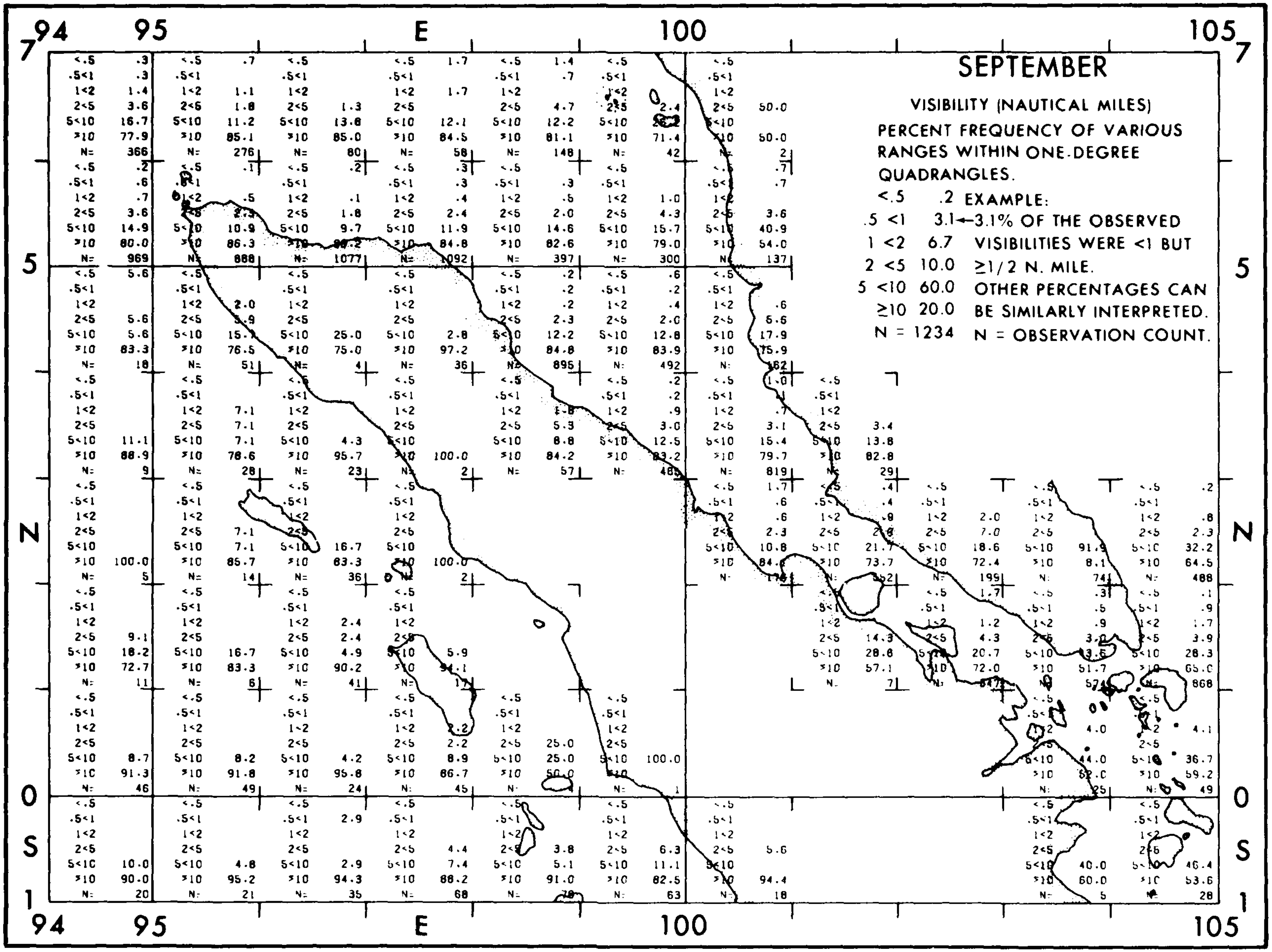

AUGUST
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency (top scale) Bars represent percent frequency of waves from each direction
Height frequency (bottom scale) Printed figures represent percent frequency of wave heights observed from each direction
5% of all waves were from the N
indicates < 5% but >0
1% of all waves were from the S with heights from 6-7.5 meters
Number of observations
2% of the waves from all directions had heights ≥10 meters
WAVE HEIGHT INTERVAL
Printed scale on bottom of chart
WAVE HEIGHT METERS

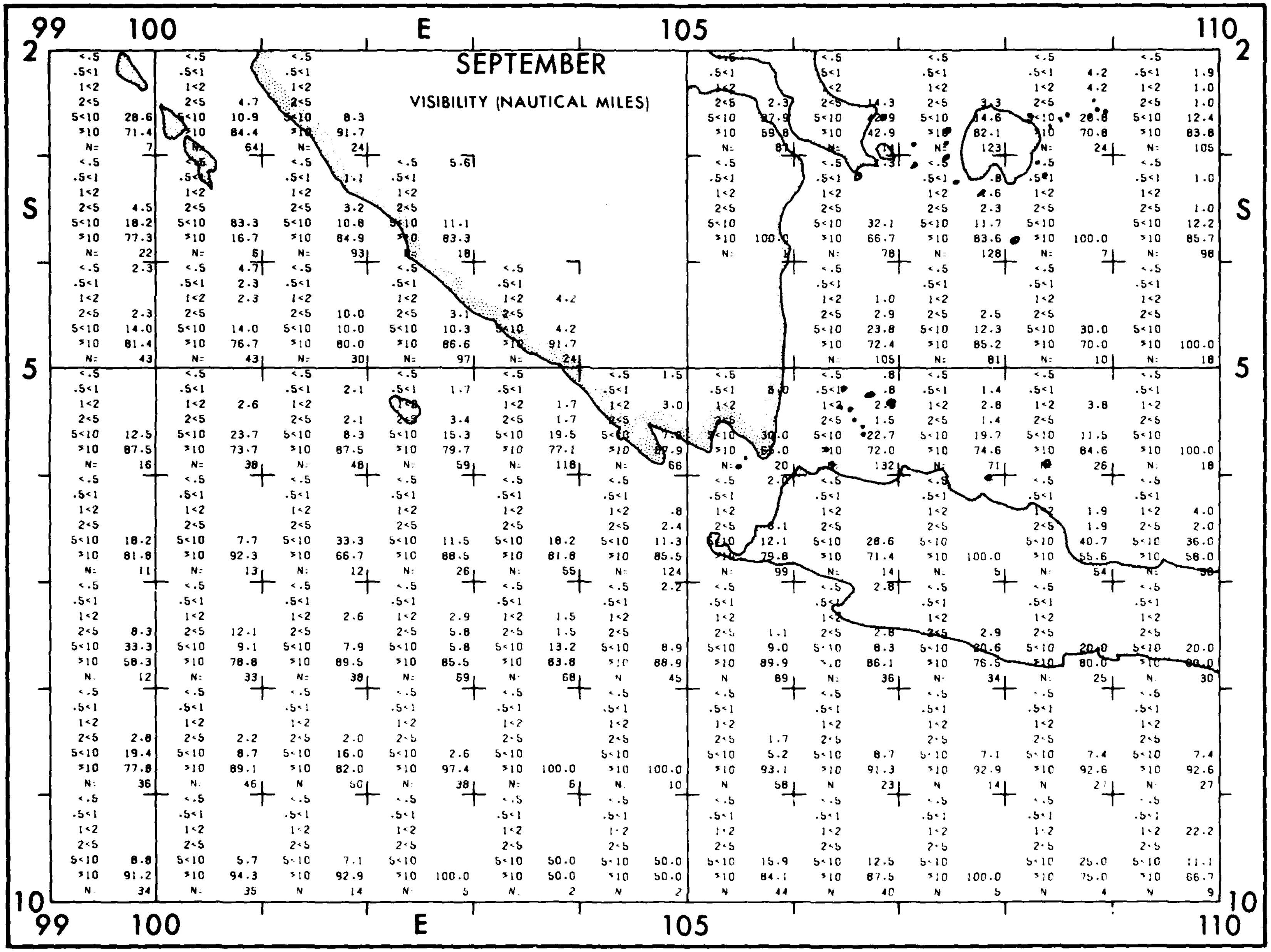

AUGUST
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

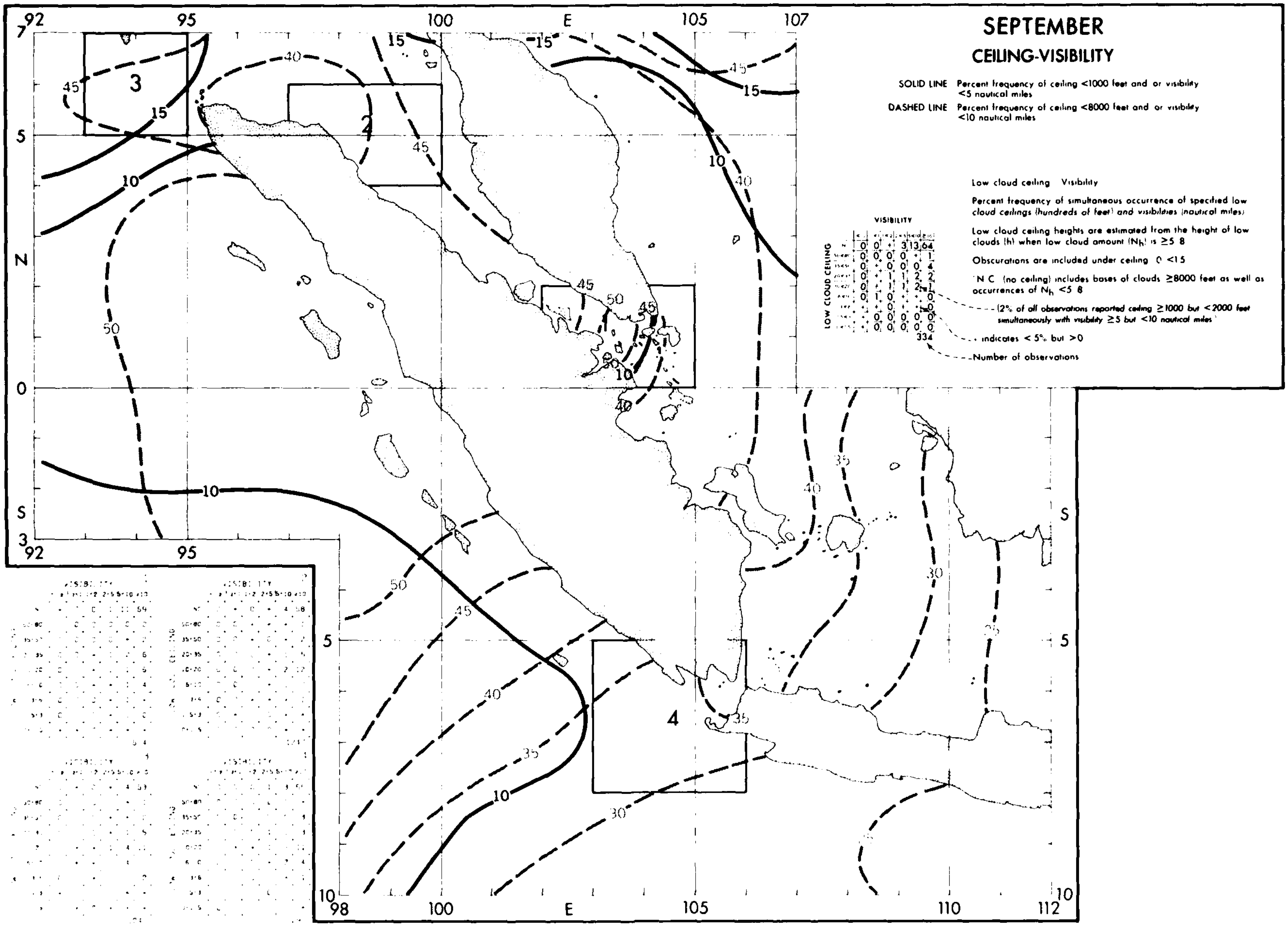

AUGUST
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10

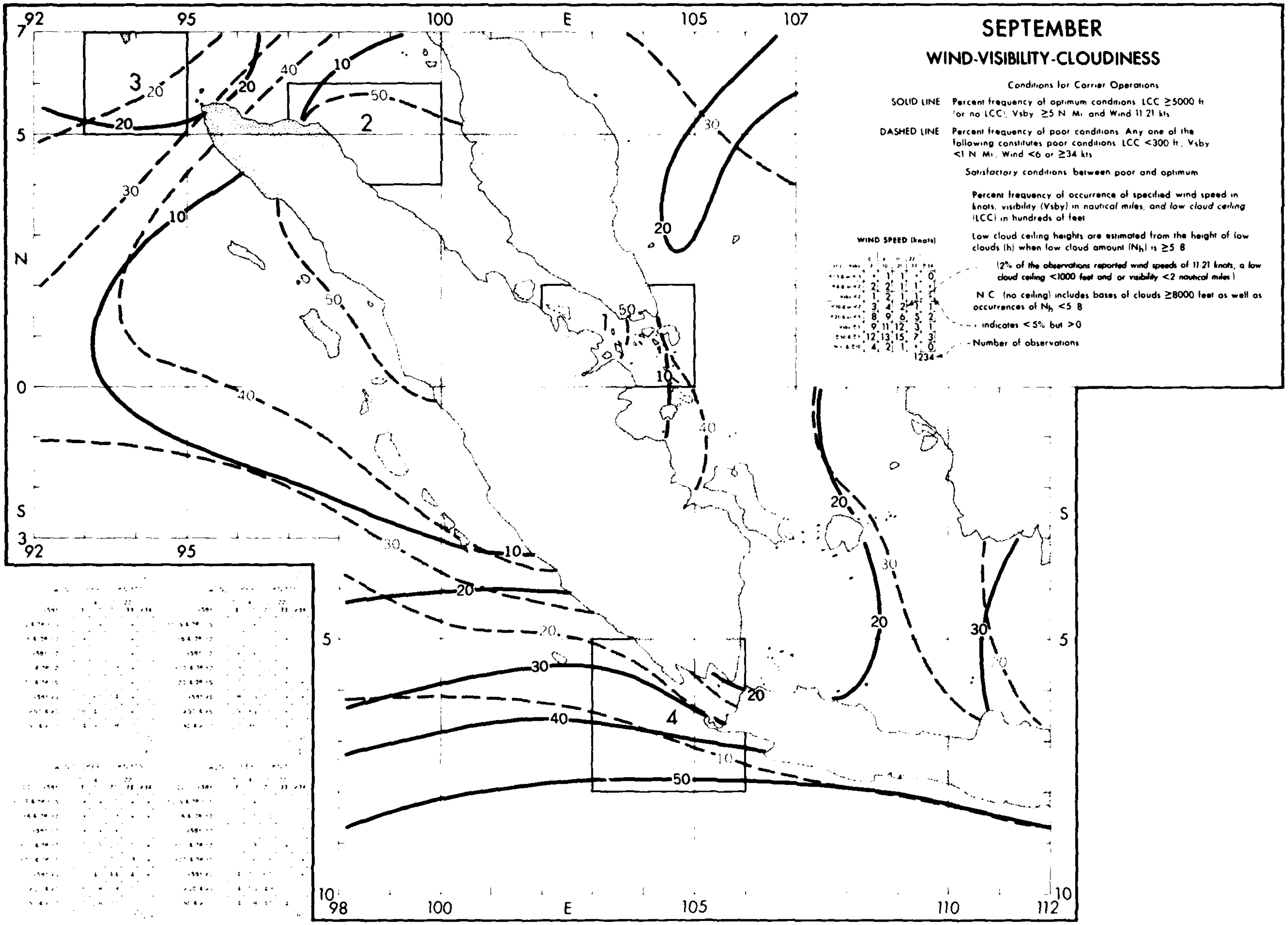

SEPTEMBER
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2/8
DASHED LINE Percent frequency of low cloud amount ≥5/8
Total Cloud Amount
Low Cloud Amount
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
CLOUD AMOUNT IN EIGHTHS
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8)
(46% of all low cloud amounts were ≤2/8)
Low cloud amount. Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
N NE E SE S SW W NW C
92
95
100
105
107
98
110
112
E
N
S
1
2
3
4
CLOUD AMOUNT IN EIGHTHS
2010
3602
3071
2213

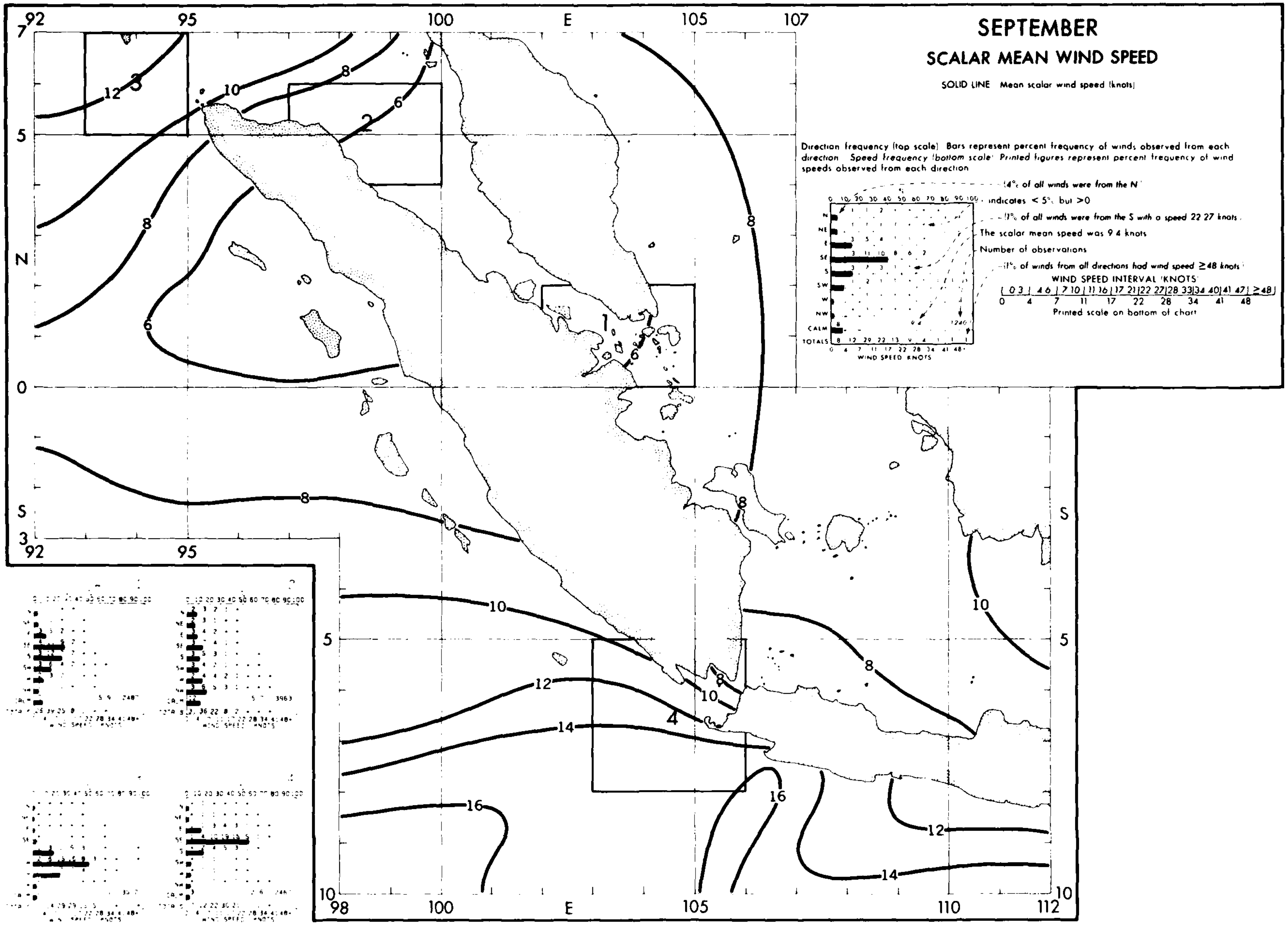

SEPTEMBER
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation, subdivided into liquid type (including freezing rain and freezing drizzle) and snow
Pcpn
Liquid
Snow
Percentage of present weather observations reporting precipitation
Number of observations
34% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10-30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
1587
31%
N NE E SE S SW W NW C
1
2
3
4
>5
10
15
5
92
95
100
105
107
98
110
112
E
N
S
0
7
3

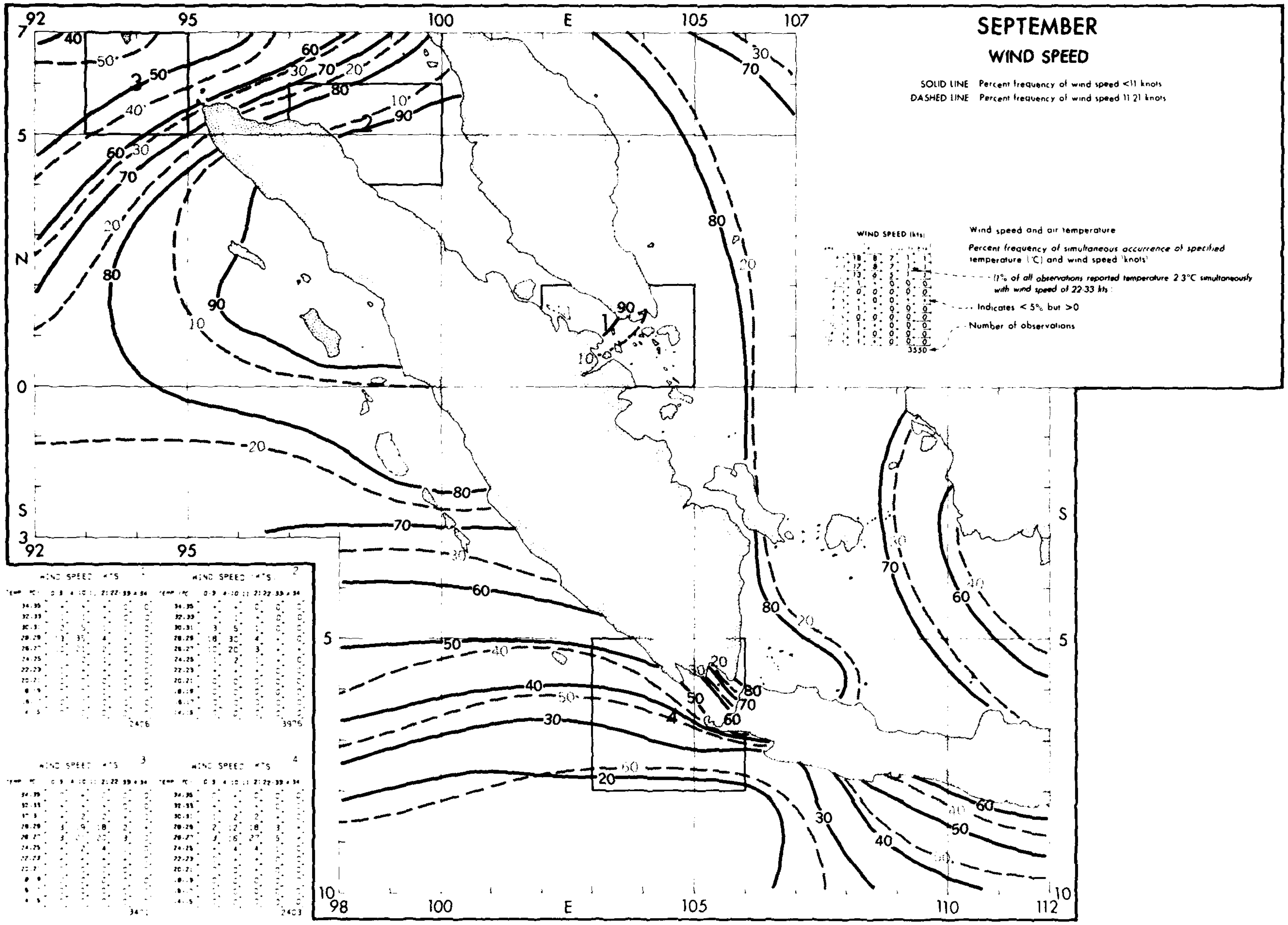

SEPTEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1

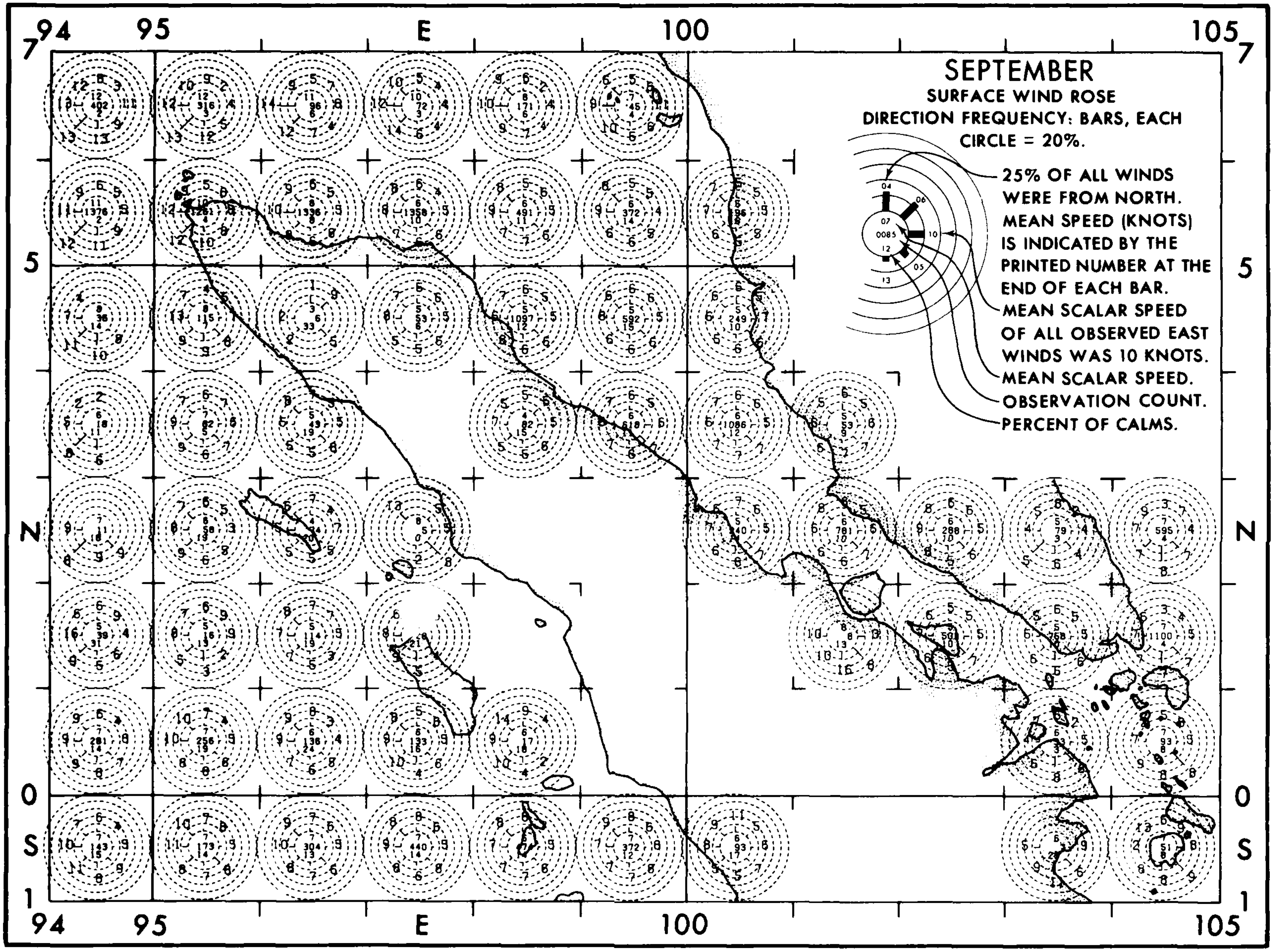

SEPTEMBER
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10

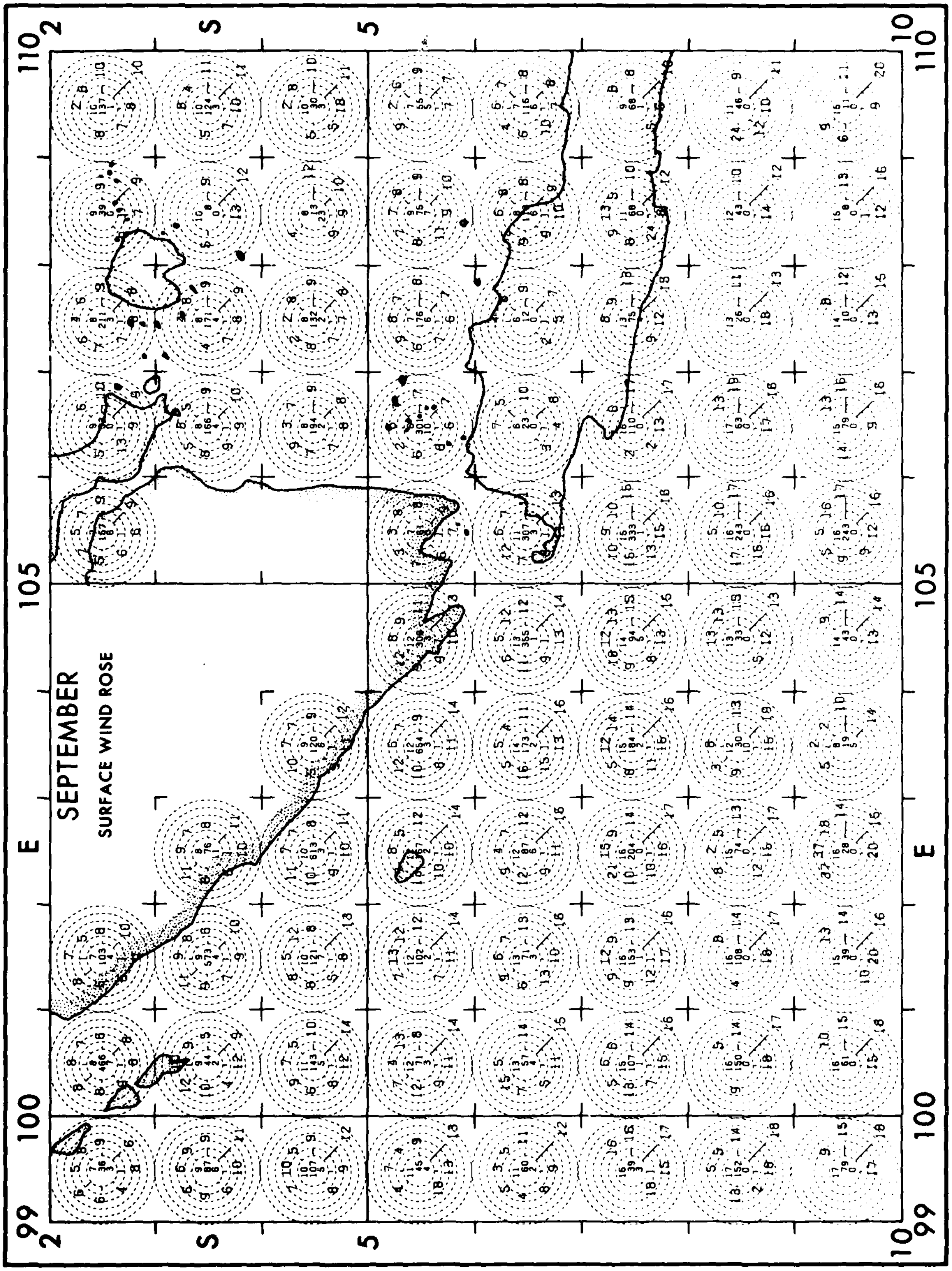

SEPTEMBER
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
Obscurations are included under ceiling 0 <15
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles)
indicates < 5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
92
95
100
E
105
107
110
112
98
N
S
0
5
10
3
7
2
3
4

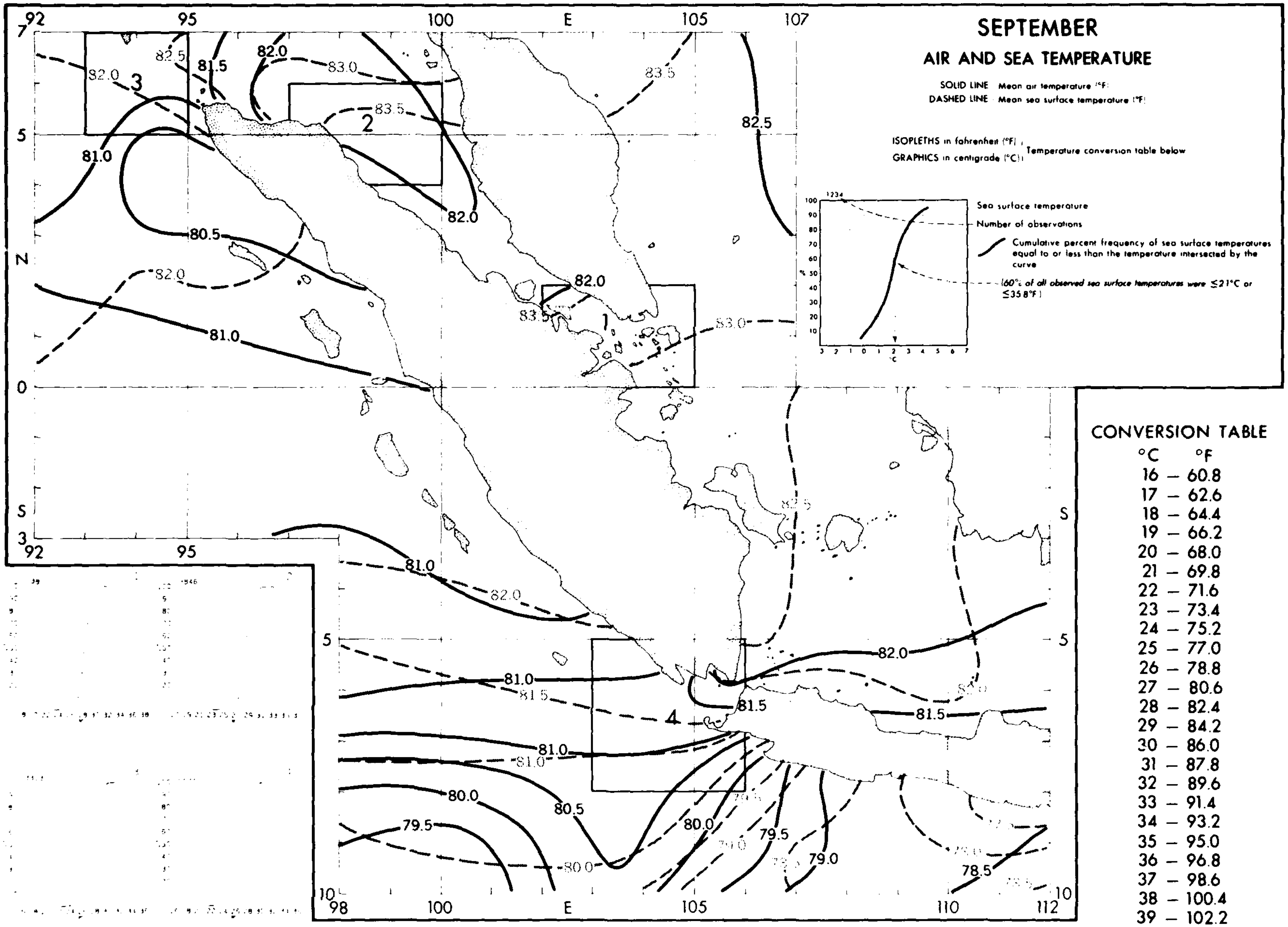

SEPTEMBER
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft (or no LCC), Vsby ≥5 N Mi and Wind 11-21 kts
DASHED LINE Percent frequency of poor conditions Any one of the following constitutes poor conditions LCC <300 ft, Vsby <1 N Mi, Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles, and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
(2% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and or visibility <2 nautical miles)
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
indicates <5% but >0
Number of observations
WIND SPEED (knots)
1234
92
95
100
E
105
107
98
110
112
7
5
N
0
S
3
10
1
2
3
4


SEPTEMBER
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots)
Direction frequency (top scale) Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale) Printed figures represent percent frequency of wind speeds observed from each direction
14% of all winds were from the N
indicates < 5% but > 0
11% of all winds were from the S with a speed 22-27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥ 48 knots
WIND SPEED INTERVAL (KNOTS)
0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 22-27 | 28-33 | 34-40 | 41-47 | ≥48
0 4 7 11 17 22 28 34 41 48
Printed scale on bottom of chart
WIND SPEED KNOTS
N
NE
E
SE
S
SW
W
NW
CALM
TOTALS
92
95
100
105
107
110
112
98
E
N
S
0
5
10
7
3
1
2
3
4


SEPTEMBER
WIND SPEED
SOLID LINE Percent frequency of wind speed <11 knots
DASHED LINE Percent frequency of wind speed 11-21 knots
WIND SPEED (kts)
Wind speed and air temperature
Percent frequency of simultaneous occurrence of specified temperature (°C) and wind speed (knots)
(1% of all observations reported temperature 23°C simultaneously with wind speed of 22-33 kts)
Indicates < 5% but >0
Number of observations
3550
92
95
100
105
107
110
112
98
E
N
S
0
5
7
3
10

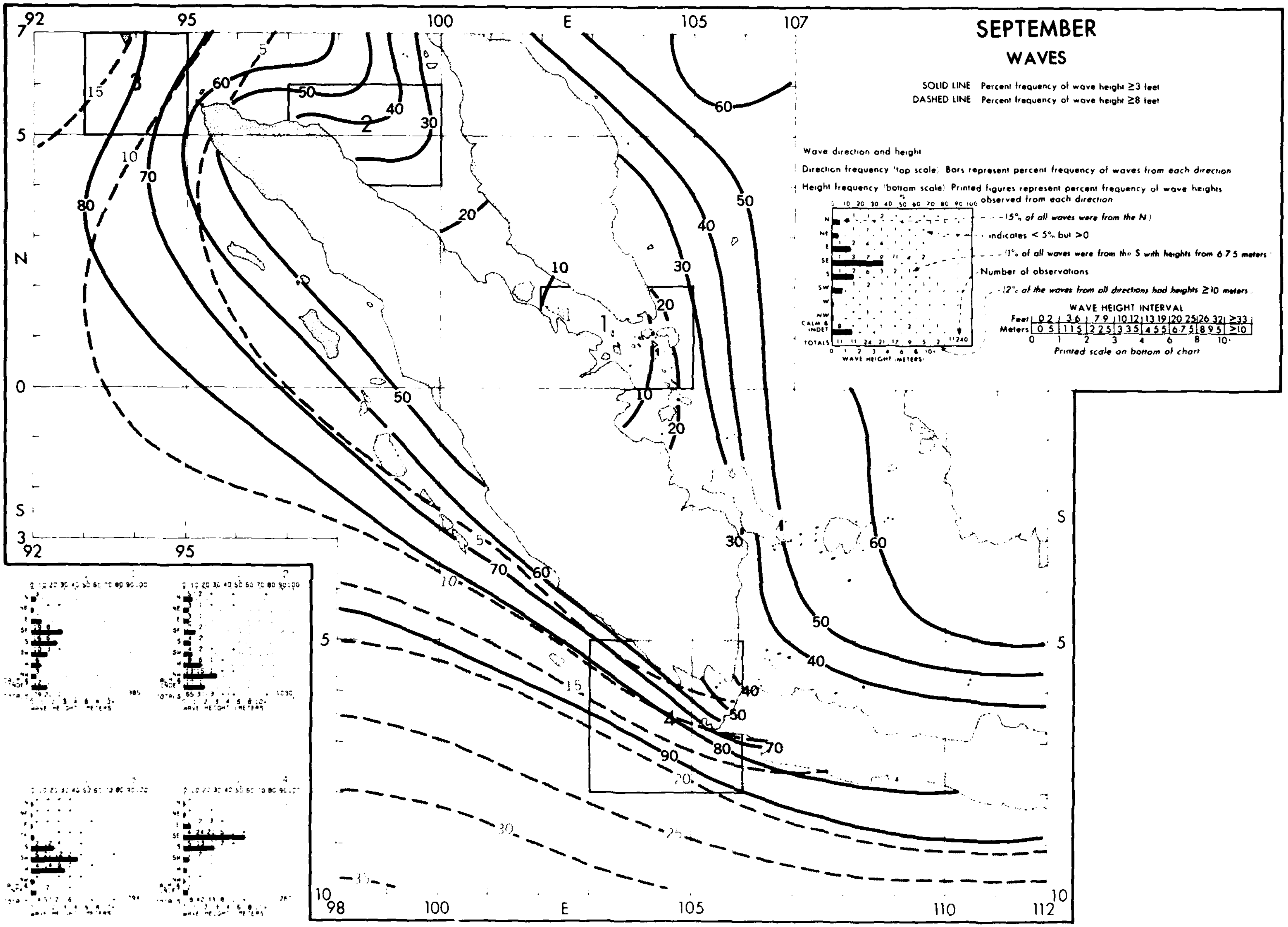

SEPTEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
E
100
105
7
5
N
0
S
1

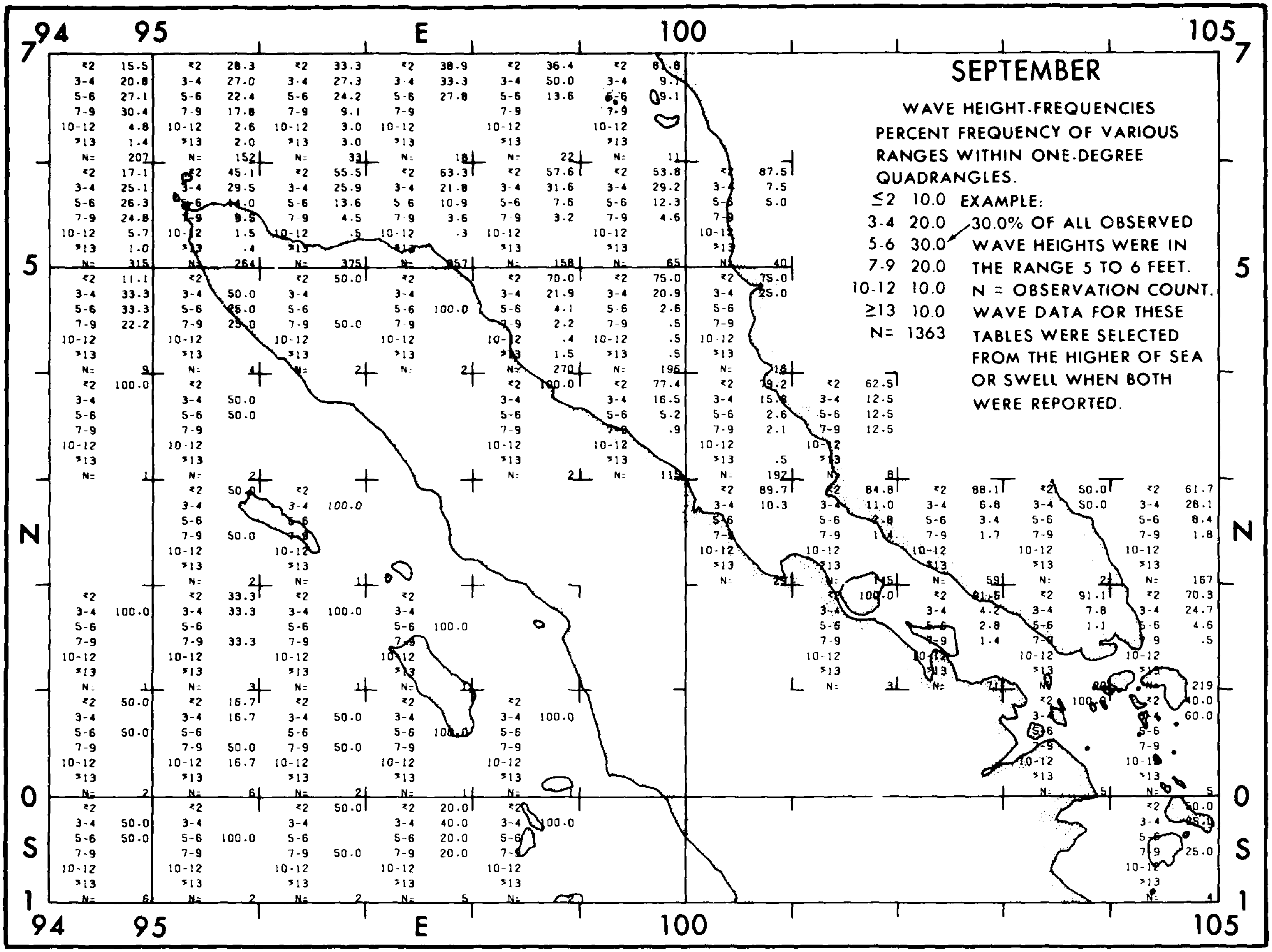

SEPTEMBER
SURFACE WIND ROSE
99
100
105
110
E
S
2
5
10

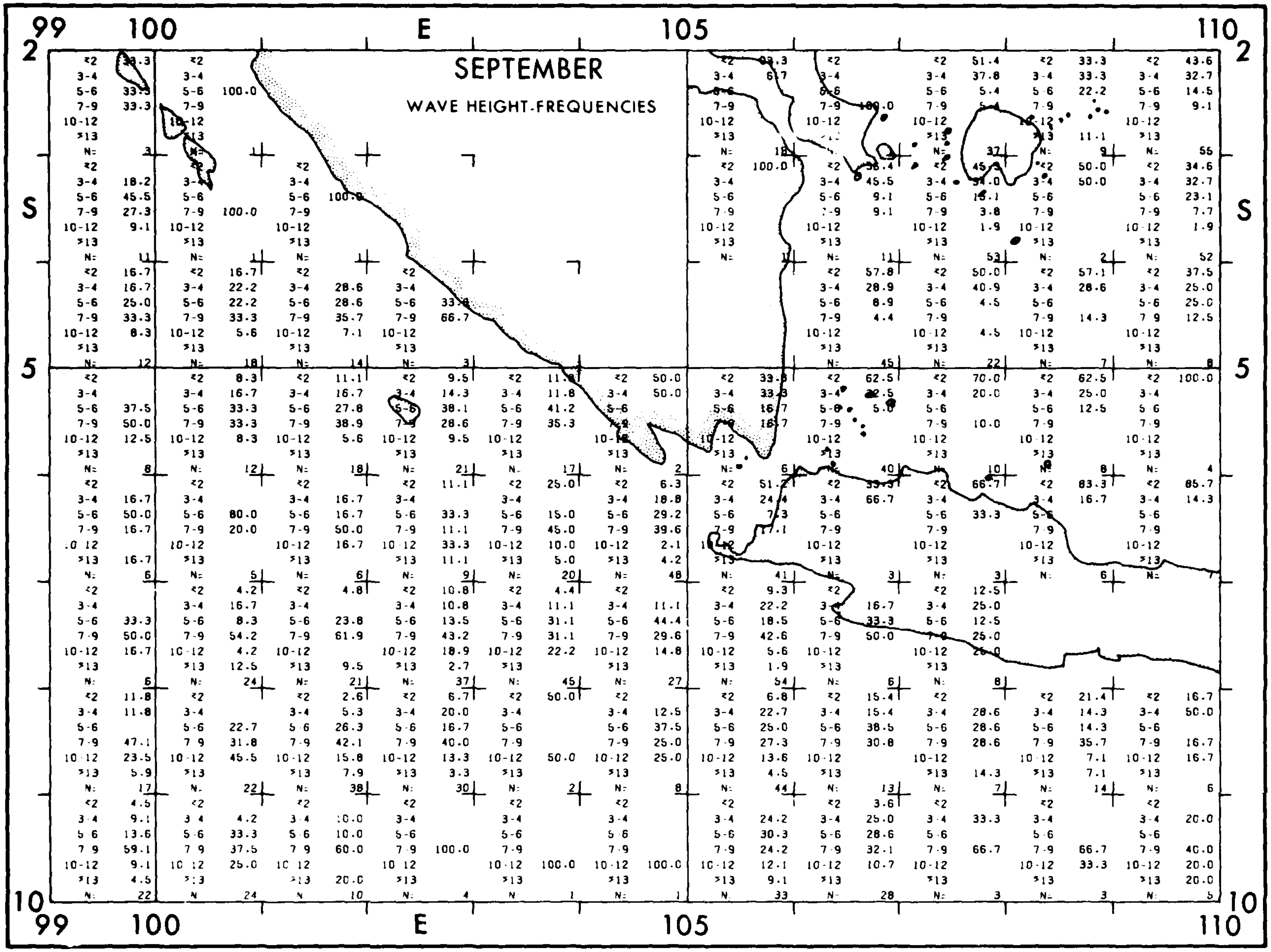


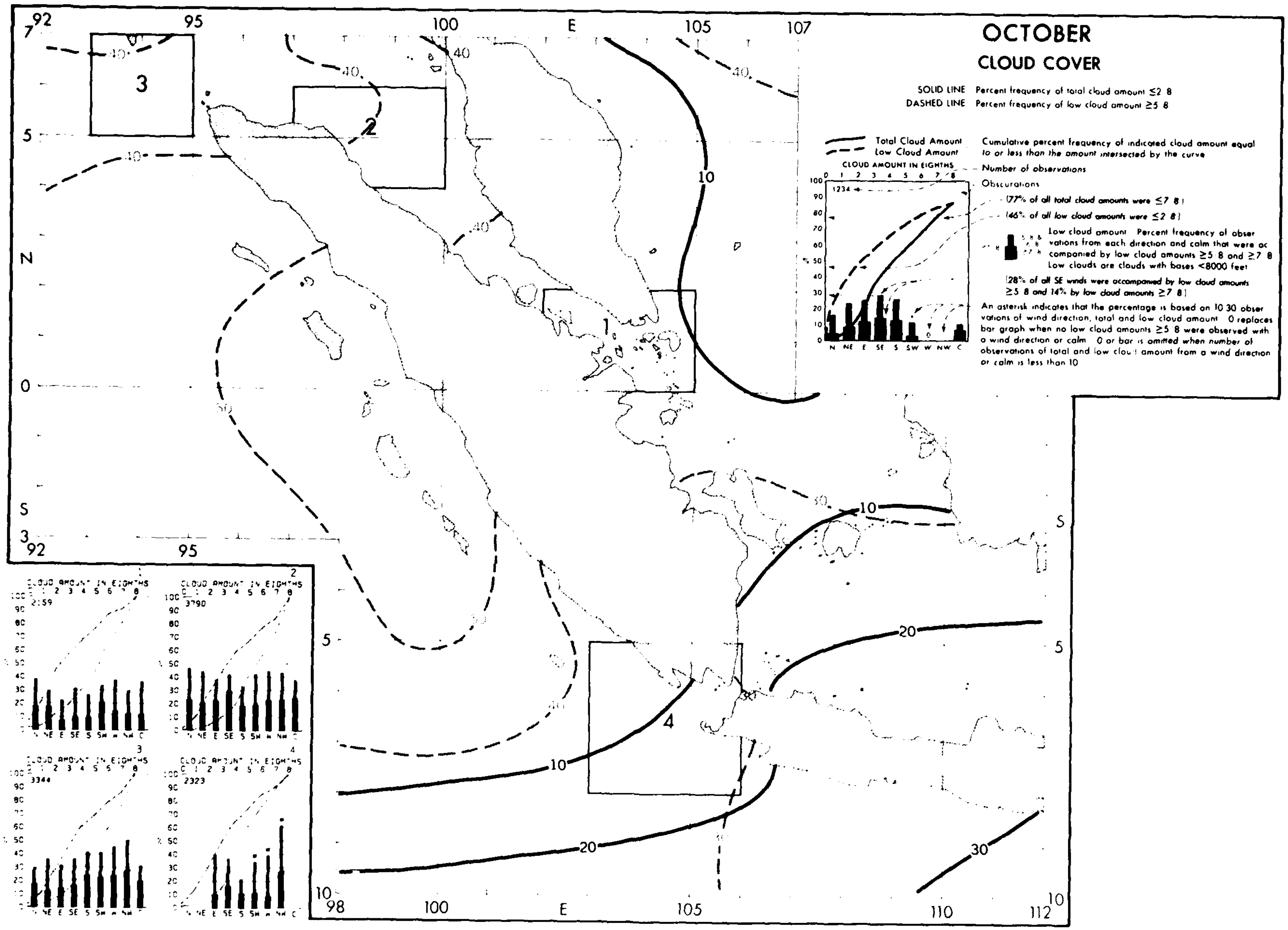
CONVERSION TABLE

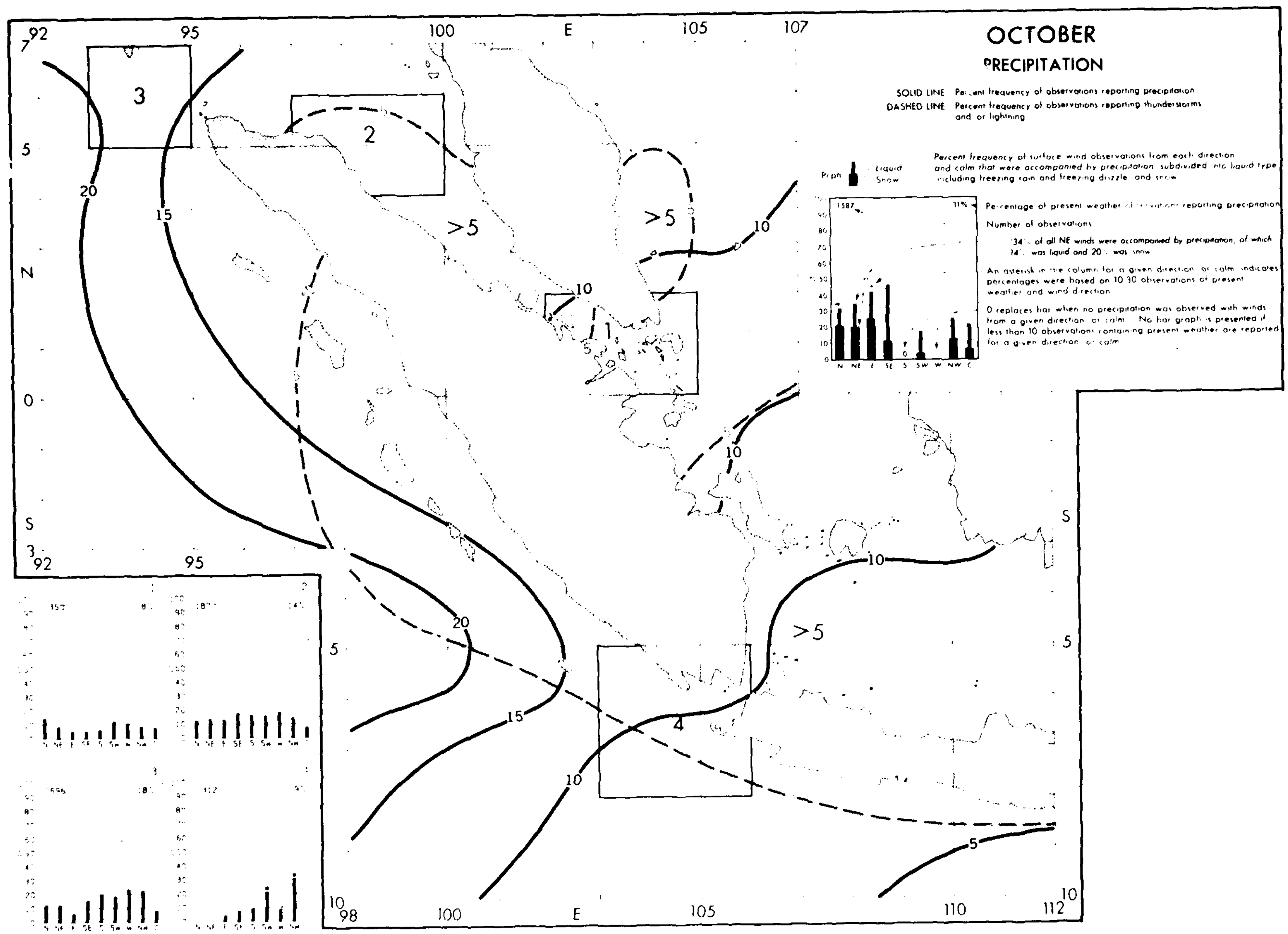
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2

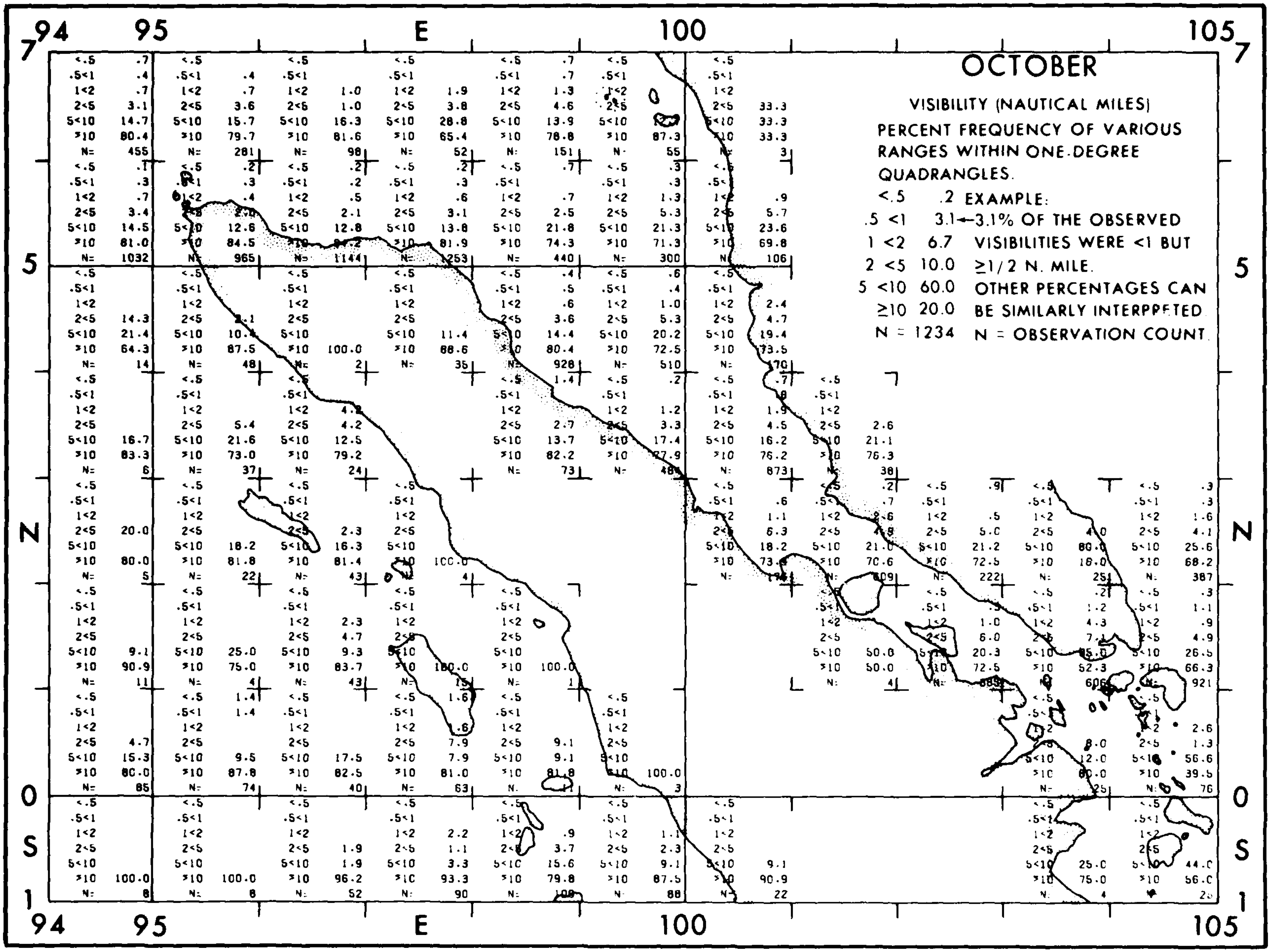

SEPTEMBER
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency (top scale): Bars represent percent frequency of waves from each direction
Height frequency (bottom scale): Printed figures represent percent frequency of wave heights observed from each direction
15% of all waves were from the N
indicates < 5% but >0
1% of all waves were from the S with heights from 6-7.5 meters
Number of observations
2% of the waves from all directions had heights ≥10 meters
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-5.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
WAVE HEIGHT (METERS)

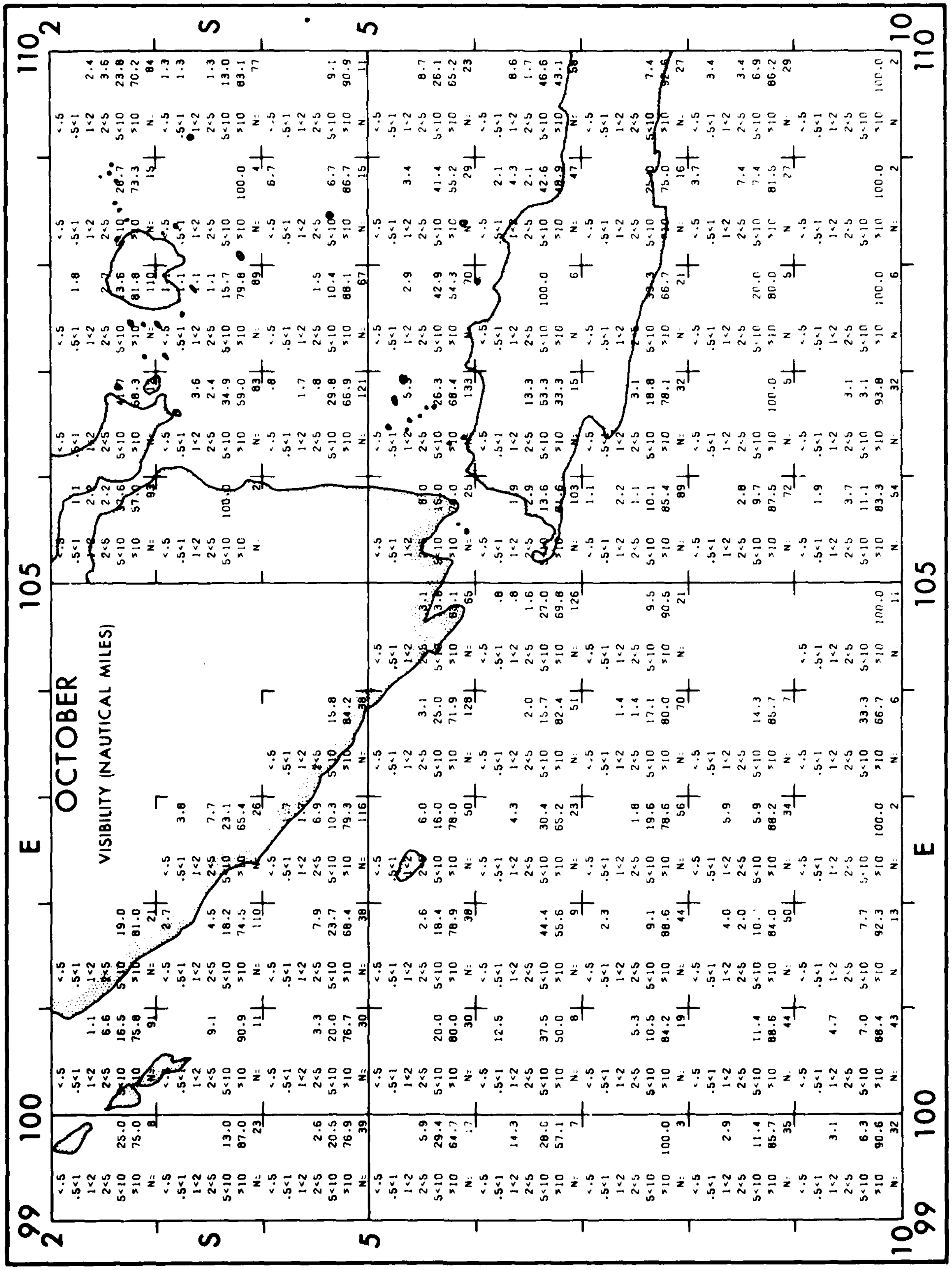

SEPTEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
30.0% OF ALL OBSERVED
WAVE HEIGHTS WERE IN
THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE
TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

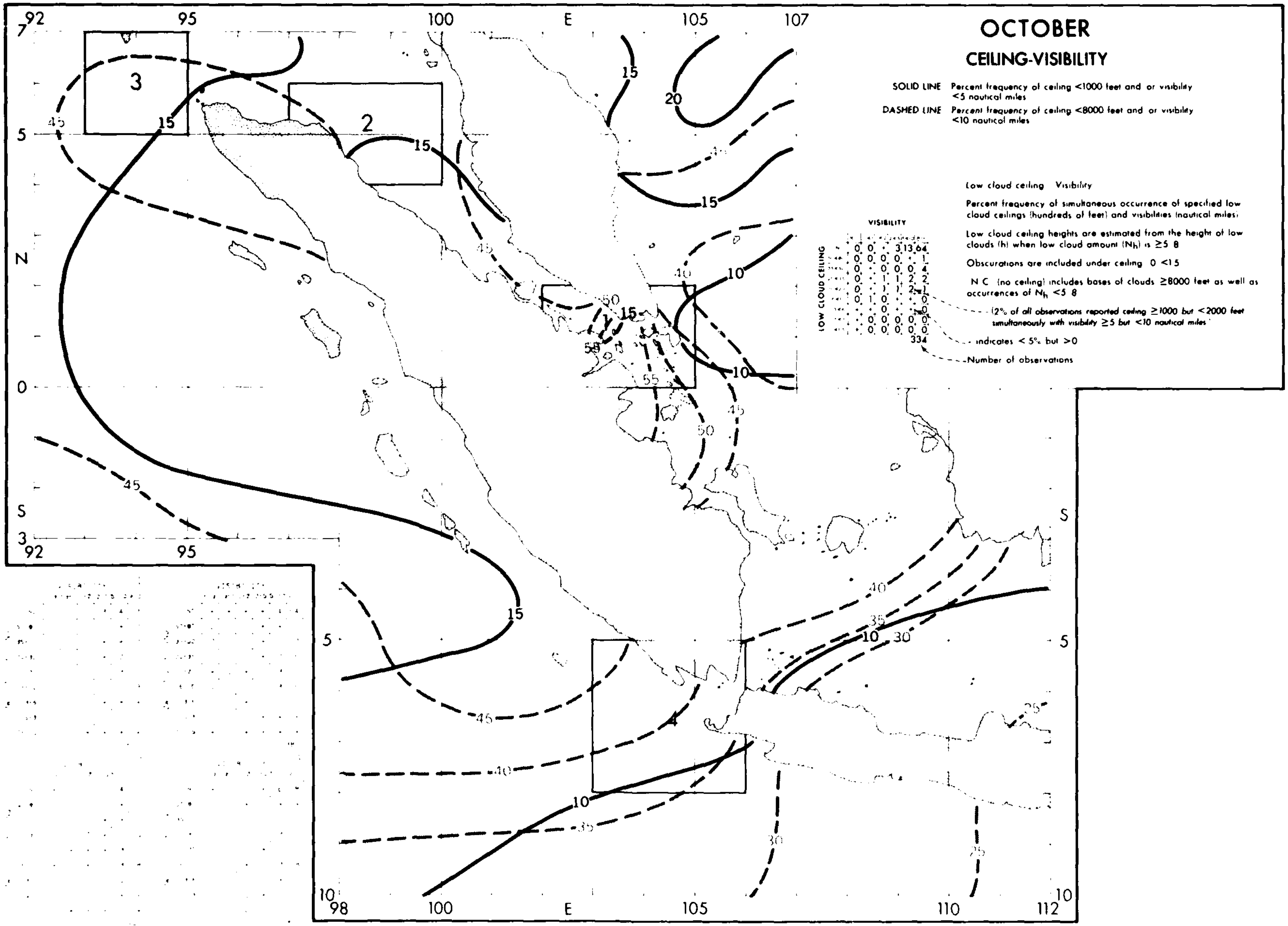

SEPTEMBER
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10

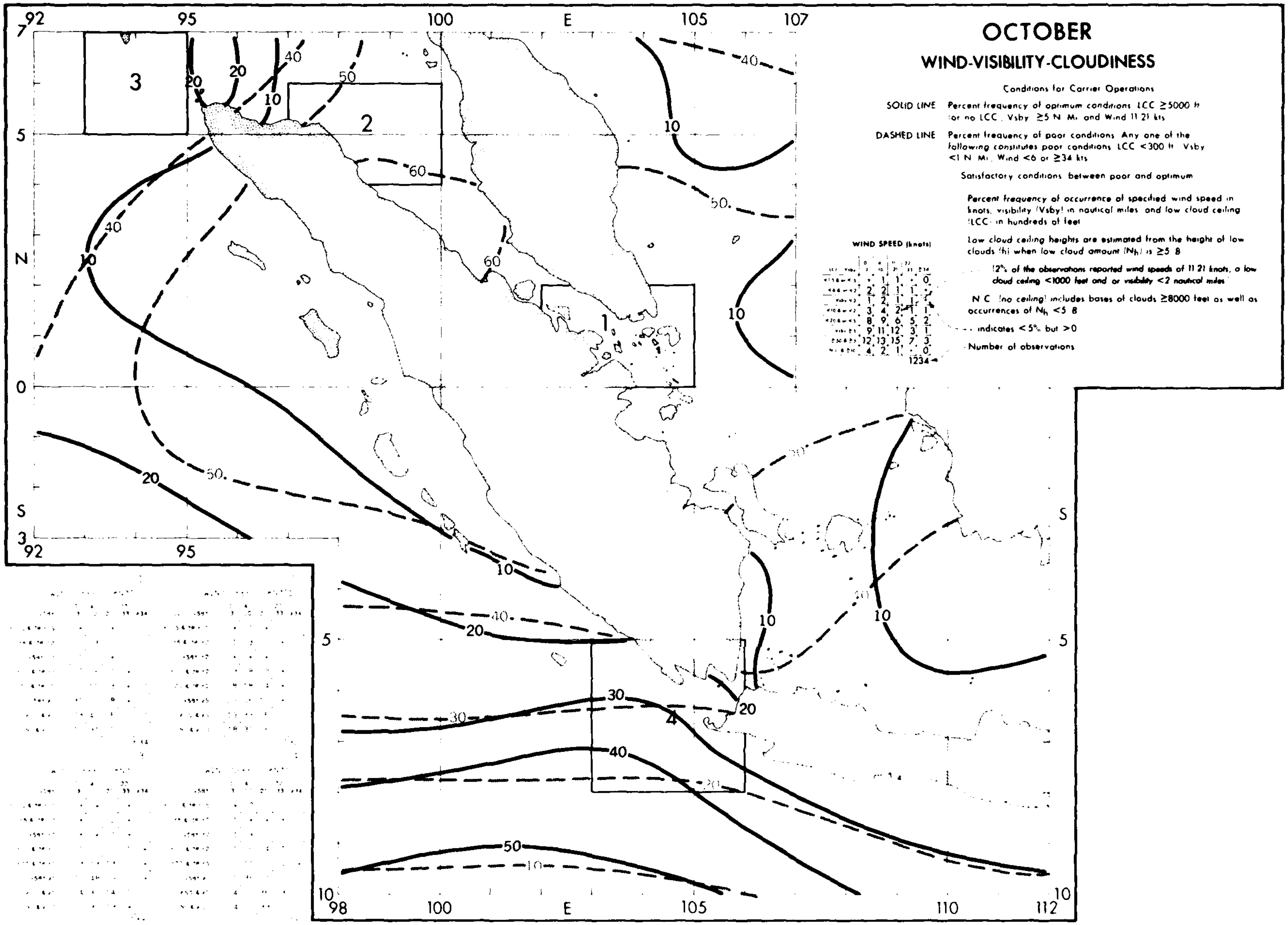

OCTOBER
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2 8
DASHED LINE Percent frequency of low cloud amount ≥5 8
Total Cloud Amount
Low Cloud Amount
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
CLOUD AMOUNT IN EIGHTHS
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7 8)
(46% of all low cloud amounts were ≤2 8)
Low cloud amount Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5 8 and ≥7 8 Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5 8 and 14% by low cloud amounts ≥7 8)
An asterisk indicates that the percentage is based on 10 30 observations of wind direction, total and low cloud amount 0 replaces bar graph when no low cloud amounts ≥5 8 were observed with a wind direction or calm 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
N NE E SE S SW W NW C
92
95
100
105
107
110
112
E
N
S
0
5
10
20
30
40
CLOUD AMOUNT IN EIGHTHS

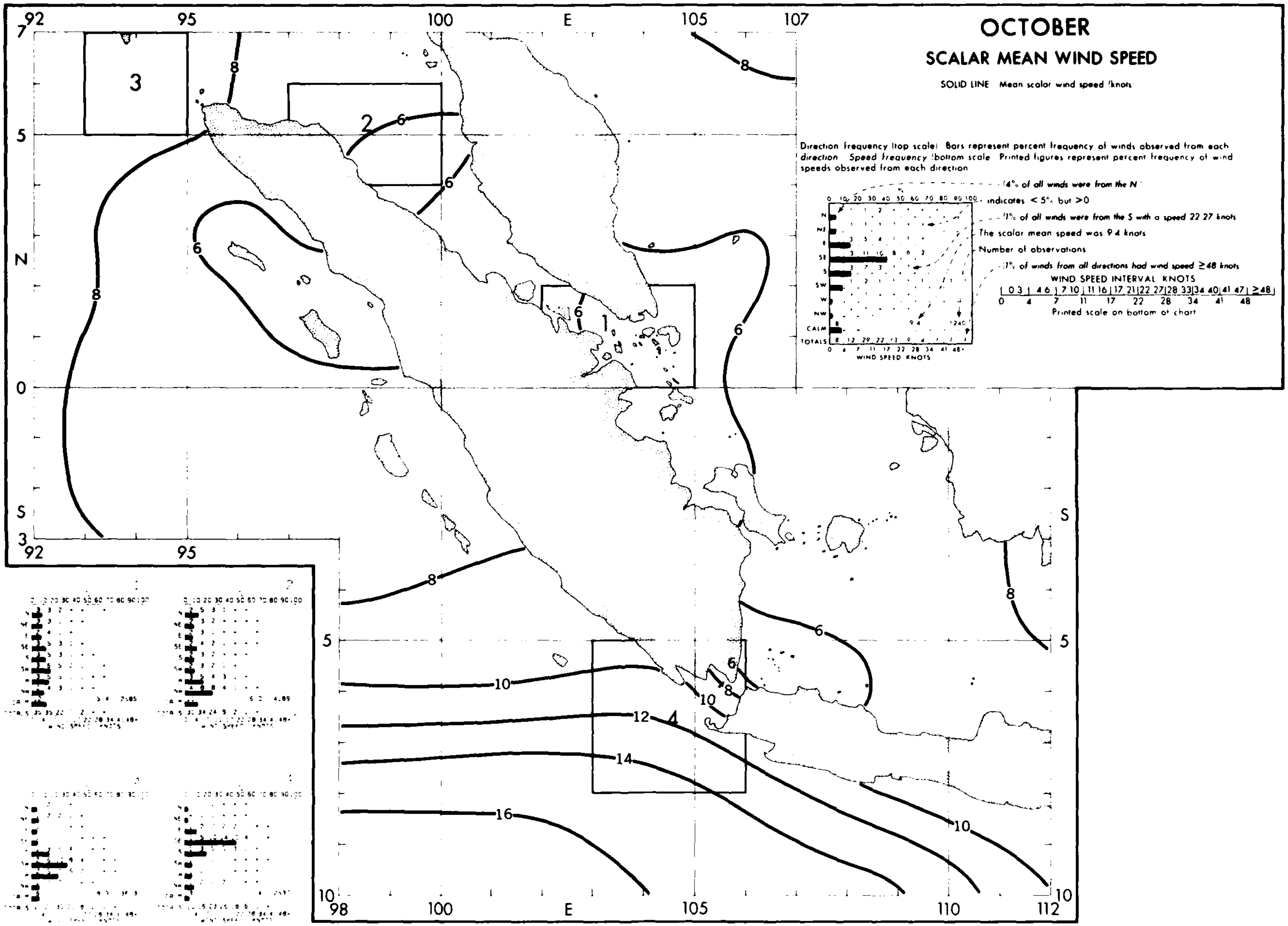

OCTOBER
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation subdivided into liquid type including freezing rain and freezing drizzle and snow
Pcpn
Liquid
Snow
Percentage of present weather observations reporting precipitation
Number of observations
34% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10-30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
1587
31%
N NE E SE S SW W NW C
1
2
3
4
>5
10
15
20
92
95
100
105
107
110
112
98
E
N
O
S

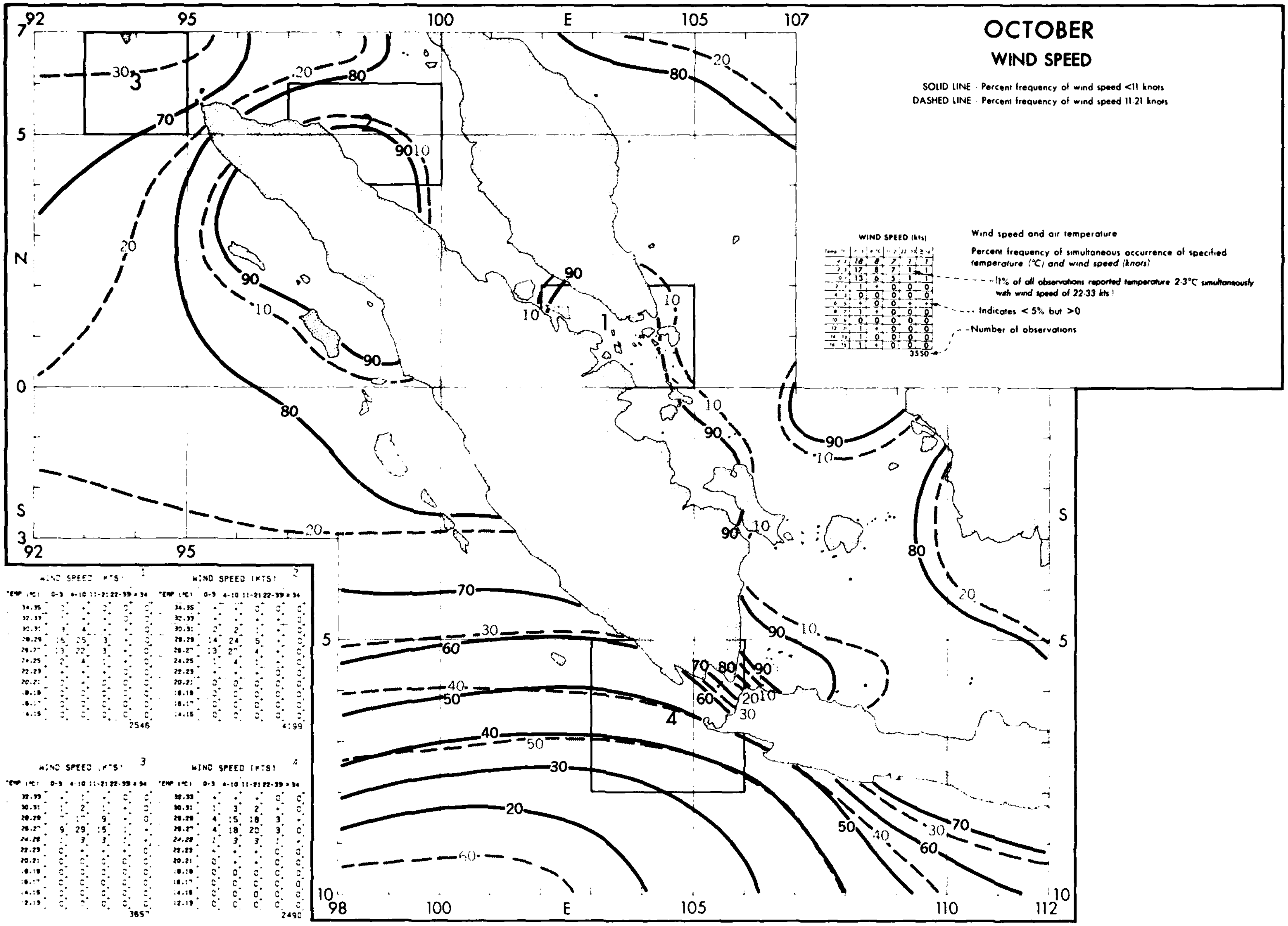

OCTOBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED
N = 1234 N = OBSERVATION COUNT
94
95
E
100
105
7
5
N
0
S
1

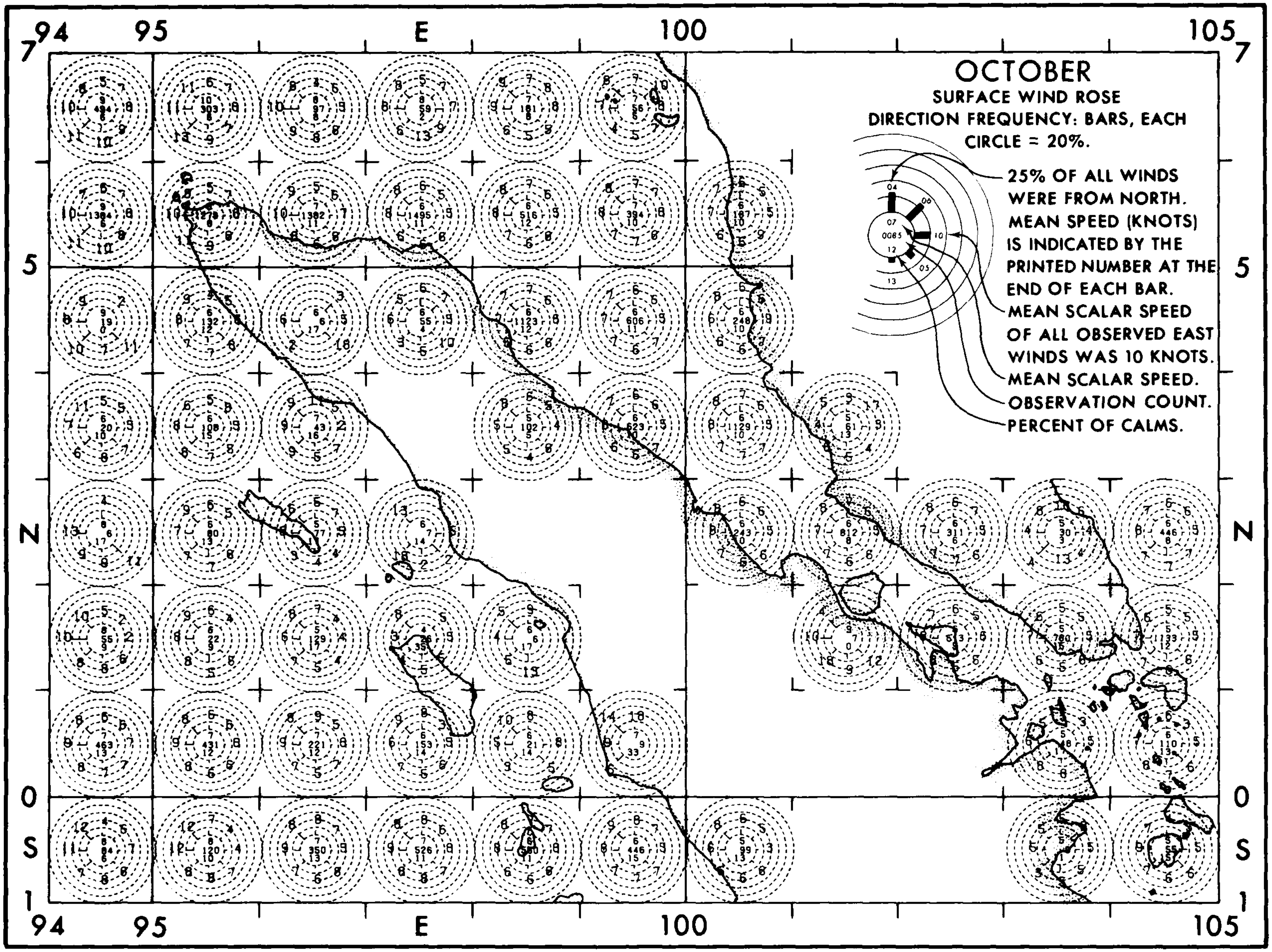

OCTOBER
VISIBILITY (NAUTICAL MILES)
E
99
100
105
110
S
5
2
10

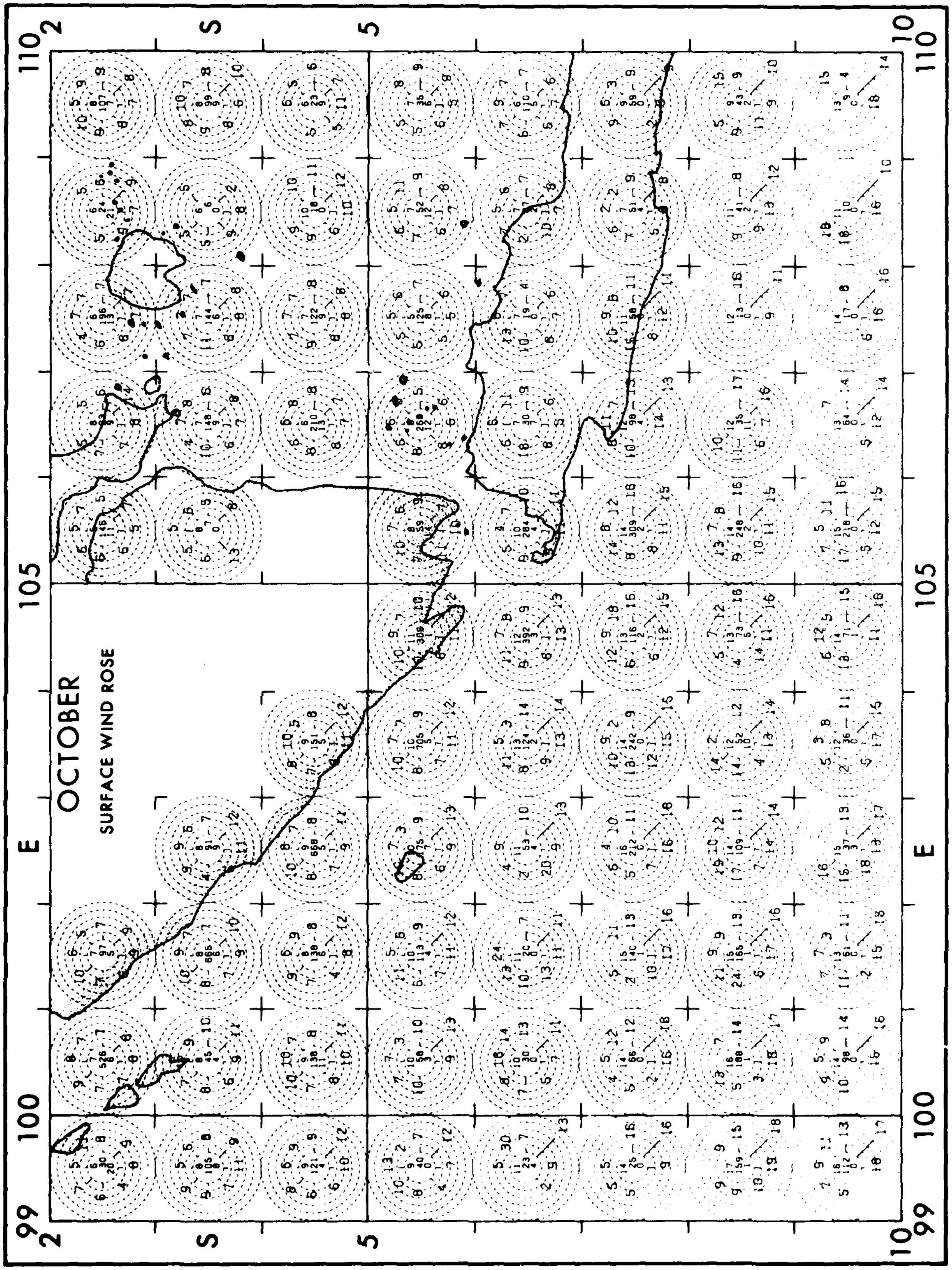

OCTOBER
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
Obscurations are included under ceiling 0 <15
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles)
indicates < 5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
92
95
100
E
105
107
98
110
112
7
5
N
0
S
3
10
2
3
4
15
20
10
45
40
50
55
35
30
25

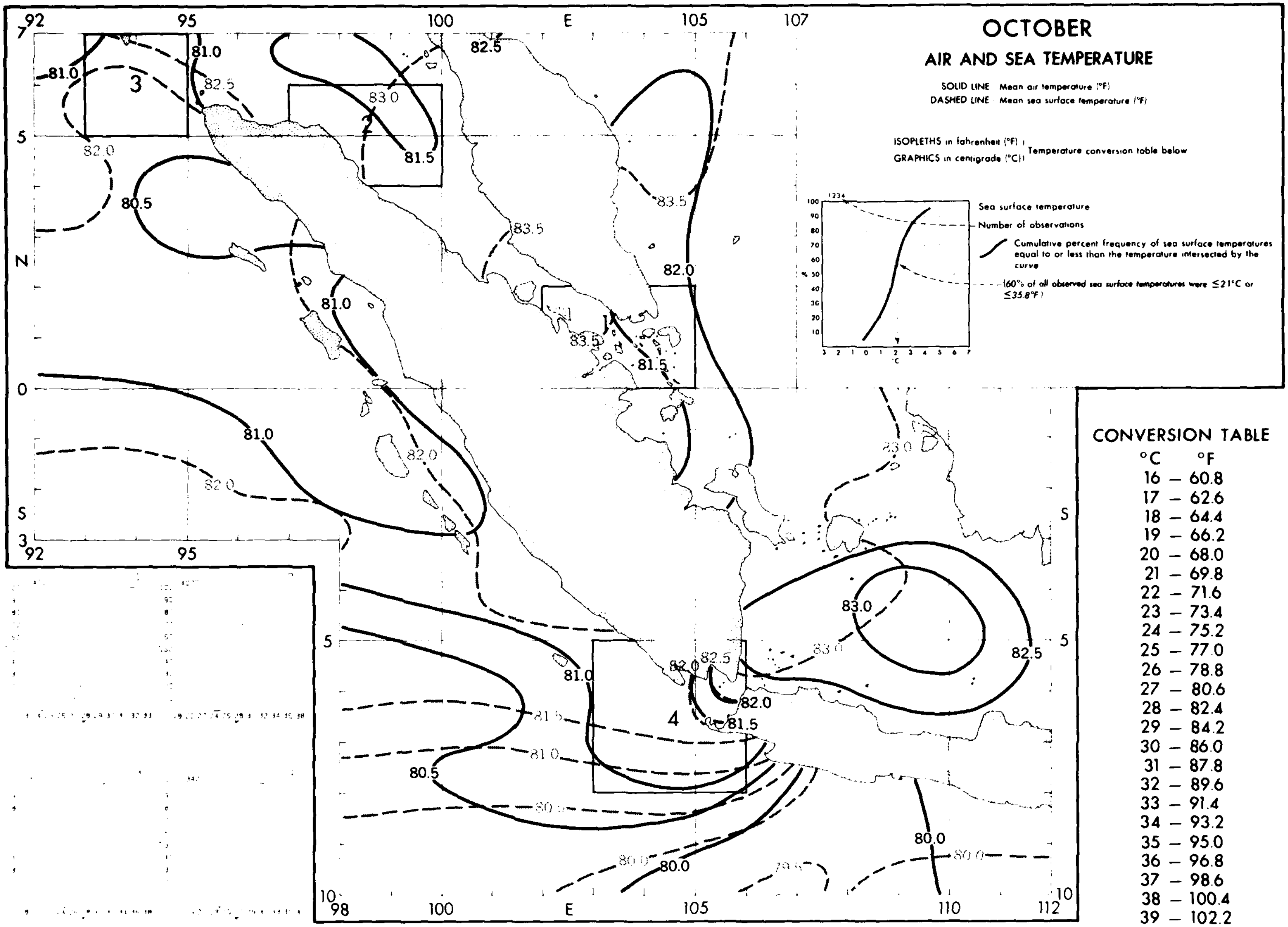

OCTOBER
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft (or no LCC), Vsby ≥5 N Mi and Wind 11-21 kts
DASHED LINE Percent frequency of poor conditions. Any one of the following constitutes poor conditions: LCC <300 ft, Vsby <1 N Mi, Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles and low cloud ceiling (LCC) in hundreds of feet
WIND SPEED (knots)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5/8
12% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and/or visibility <2 nautical miles
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5/8
indicates <5% but >0
Number of observations
1234


OCTOBER
SCALAR MEAN WIND SPEED
SOLID LINE Mean scalar wind speed (knots
Direction frequency (top scale): Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale: Printed figures represent percent frequency of wind speeds observed from each direction
14% of all winds were from the N
indicates < 5% but > 0
1% of all winds were from the S with a speed 22 27 knots
The scalar mean speed was 9.4 knots
Number of observations
1% of winds from all directions had wind speed ≥48 knots
WIND SPEED INTERVAL KNOTS
Printed scale on bottom of chart
WIND SPEED KNOTS
1
2
3
4


OCTOBER
WIND SPEED
SOLID LINE : Percent frequency of wind speed <11 knots
DASHED LINE : Percent frequency of wind speed 11-21 knots
Wind speed and air temperature
Percent frequency of simultaneous occurrence of specified temperature (°C) and wind speed (knots)
(1% of all observations reported temperature 2-3°C simultaneously with wind speed of 22-33 kts)
Indicates < 5% but >0
Number of observations
WIND SPEED (KTS)

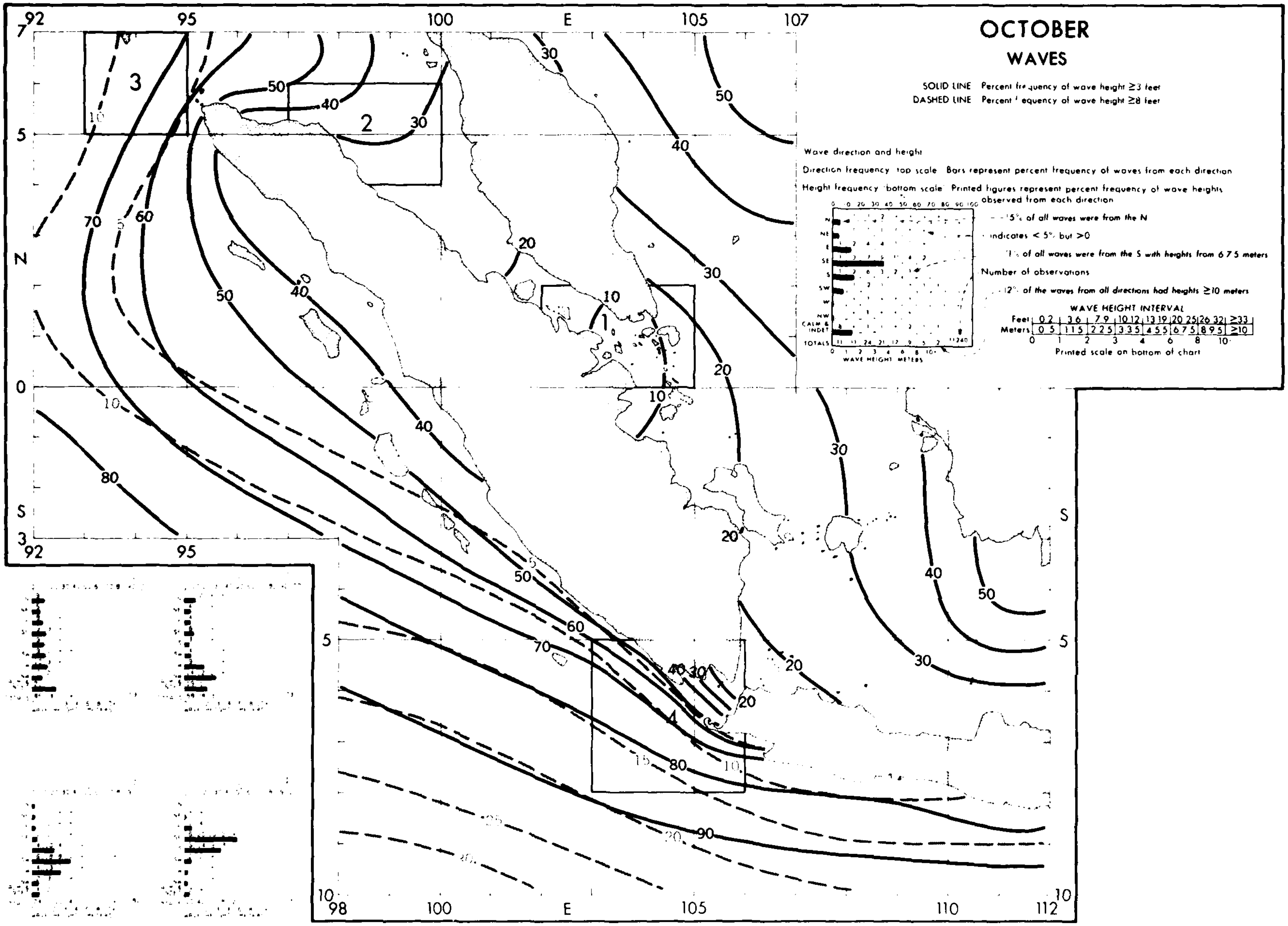

OCTOBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
E
100
105
7
5
N
0
S
1

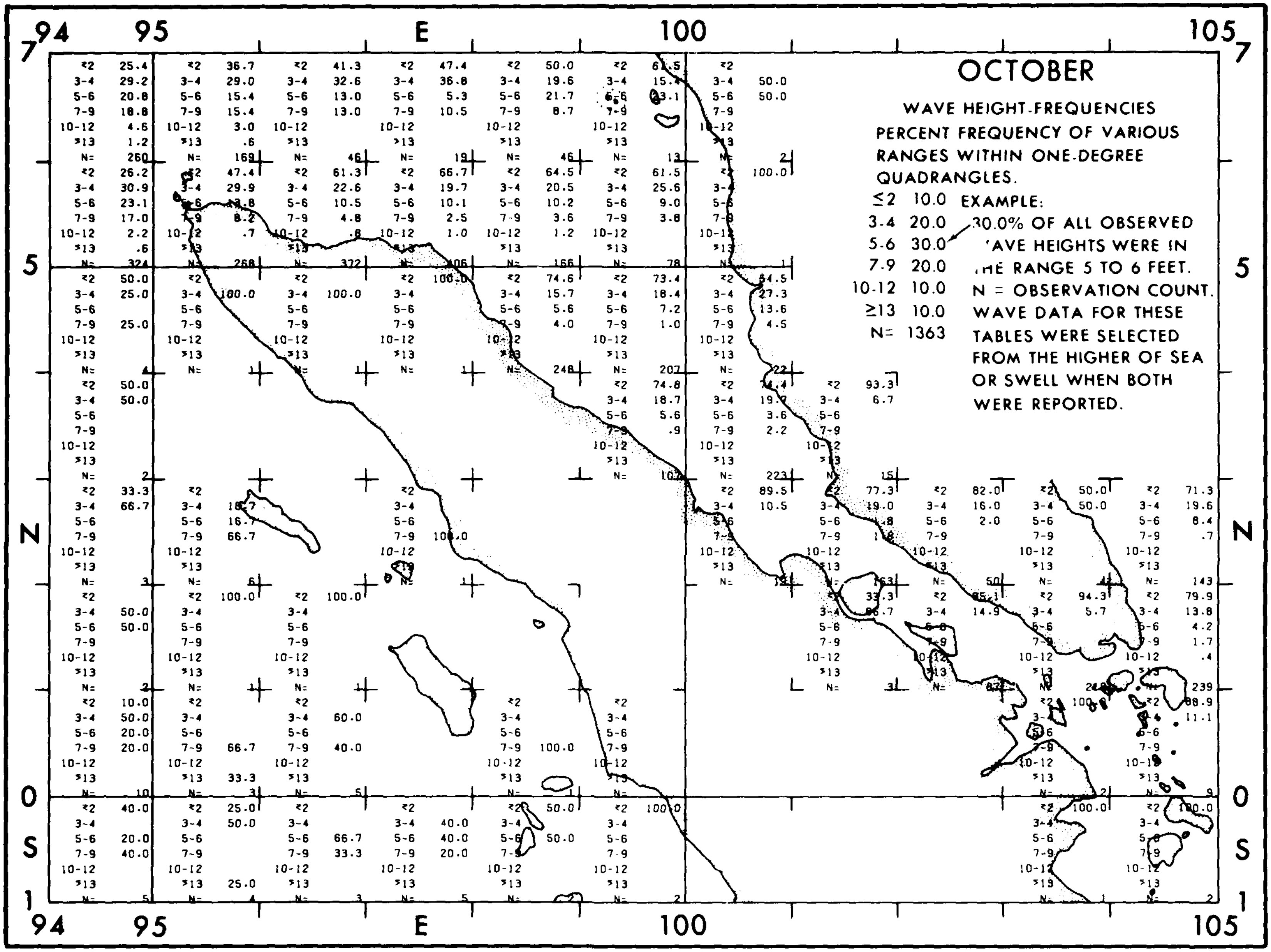

OCTOBER
SURFACE WIND ROSE

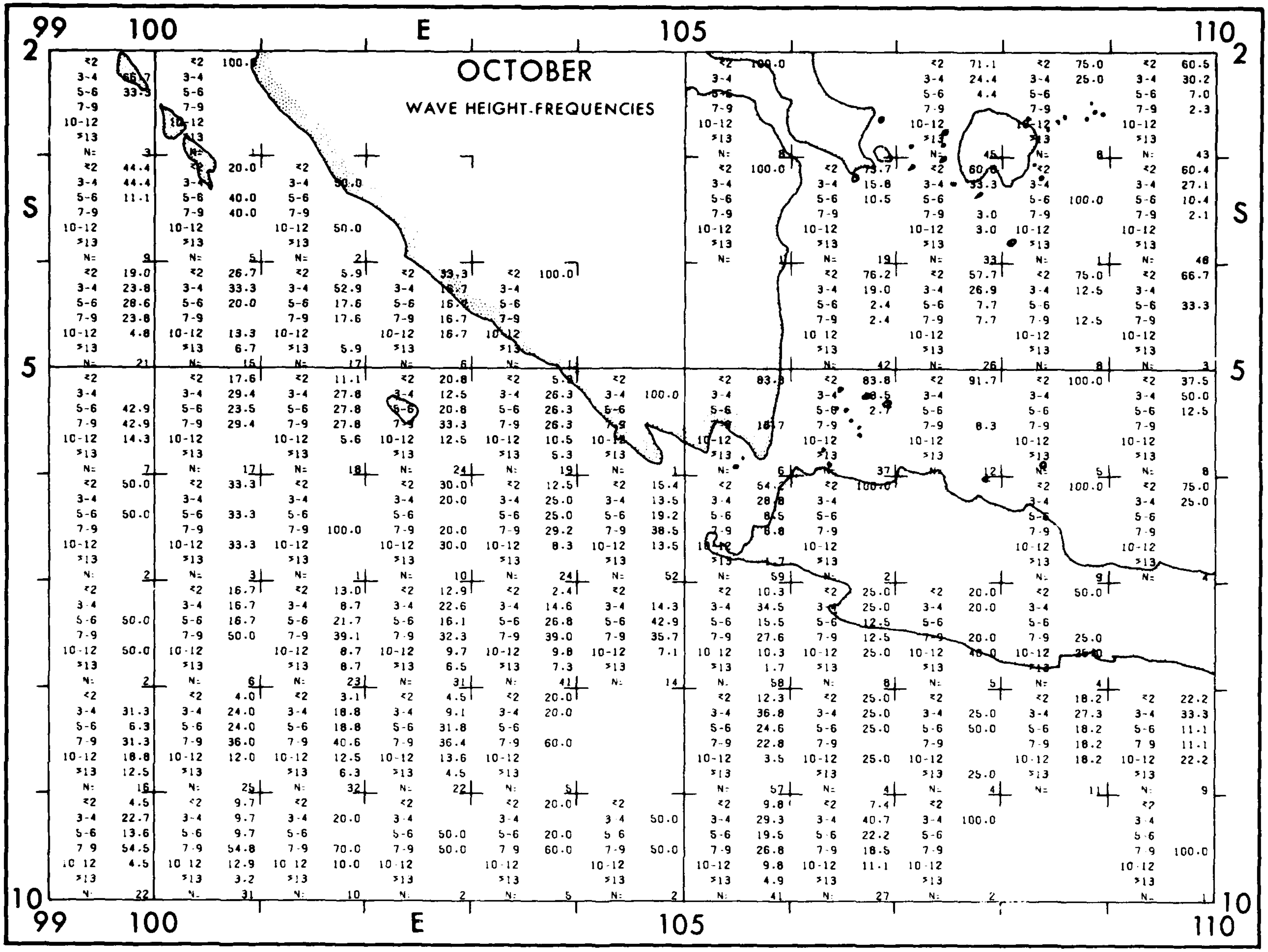


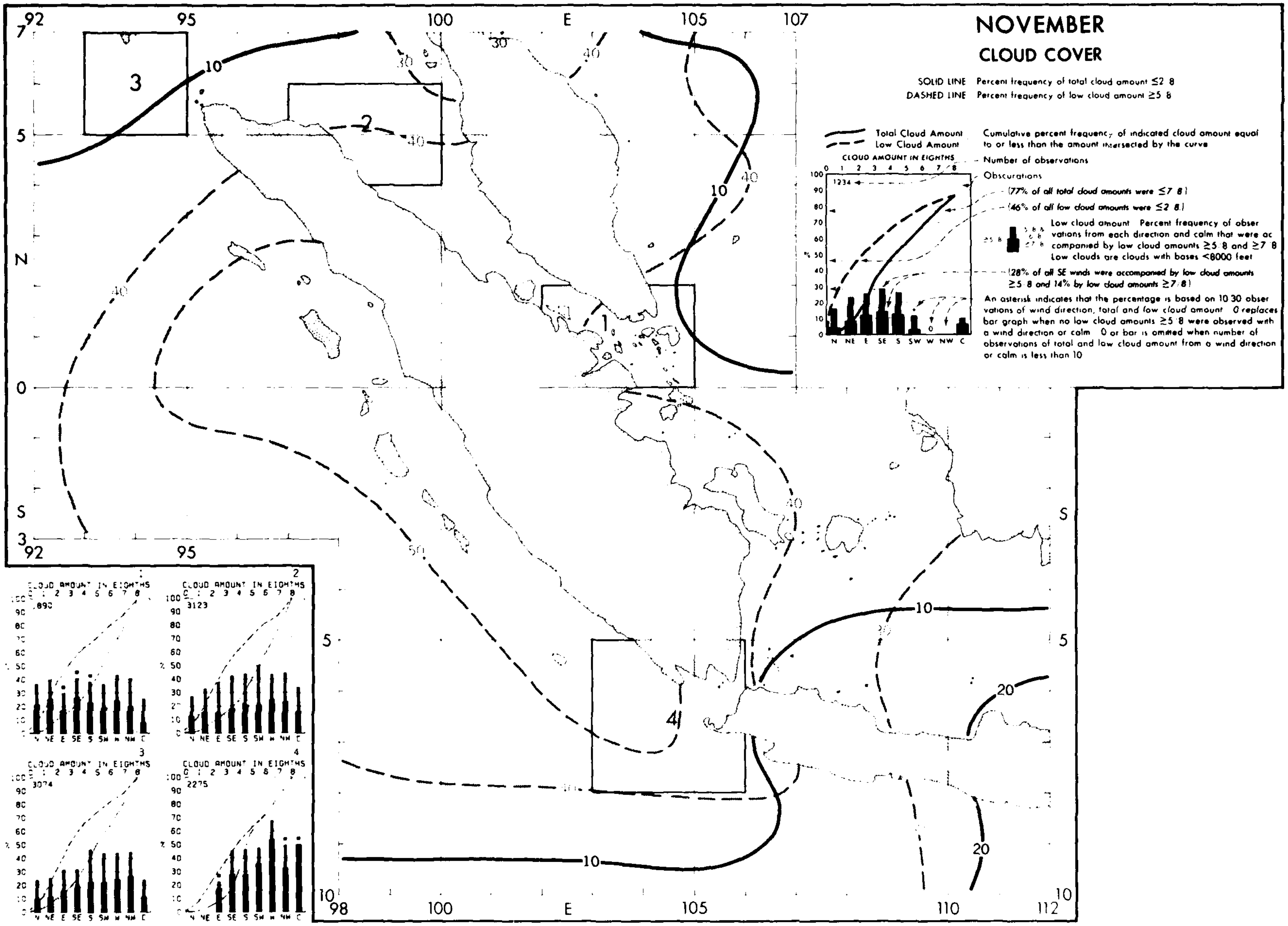
CONVERSION TABLE

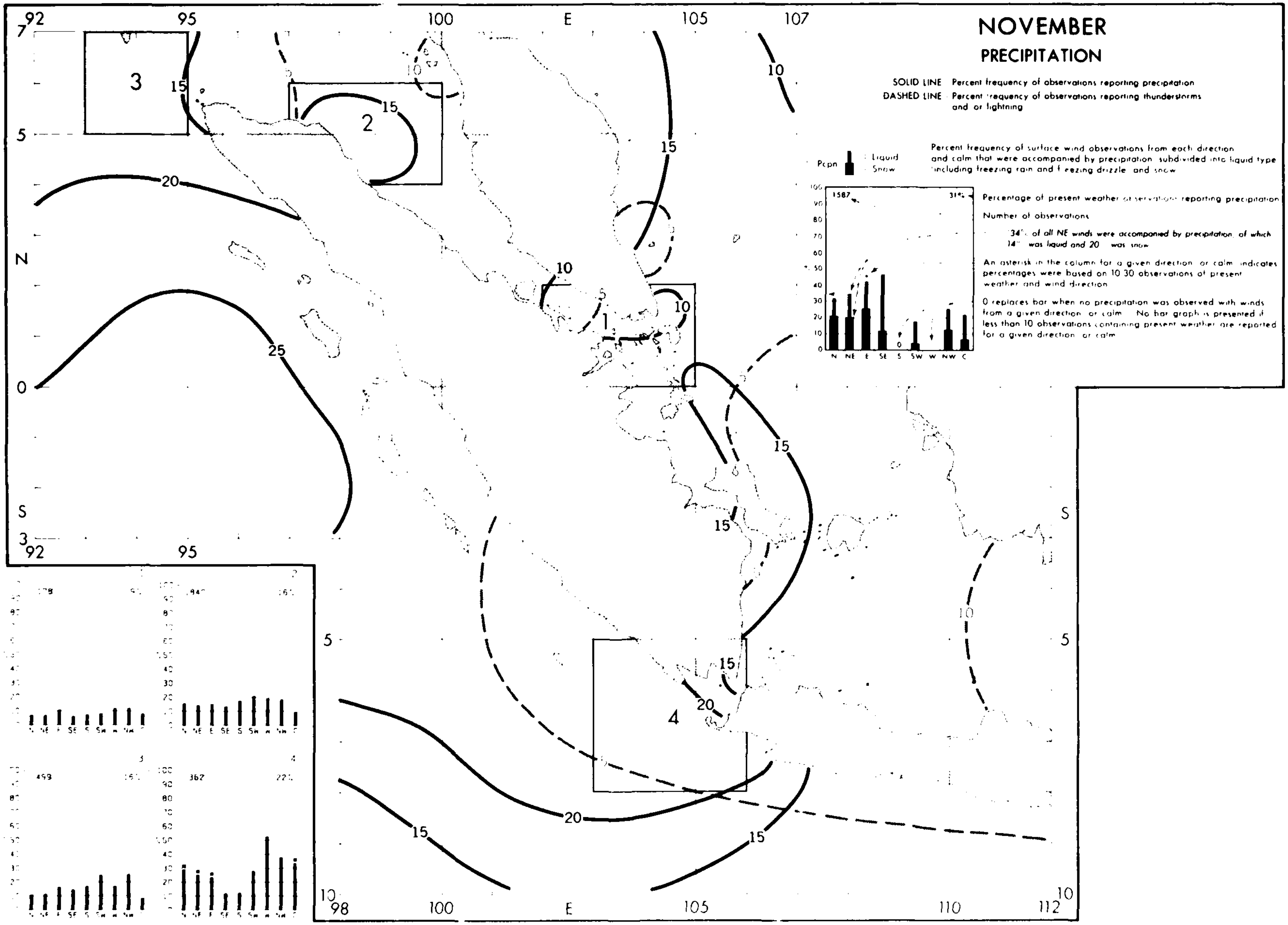
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2

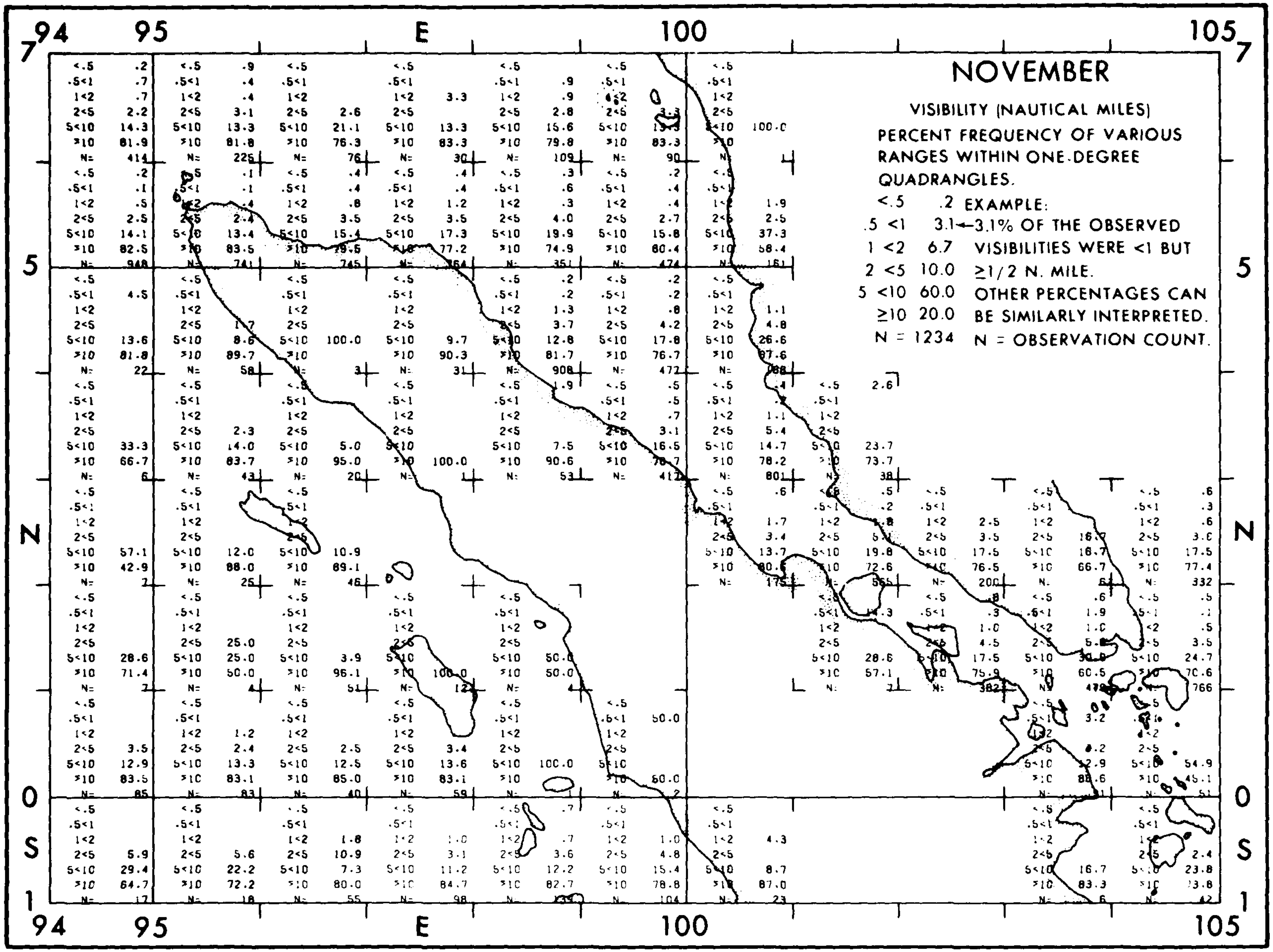

OCTOBER
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency (top scale) Bars represent percent frequency of waves from each direction
Height frequency (bottom scale) Printed figures represent percent frequency of wave heights observed from each direction
15% of all waves were from the N
indicates < 5% but > 0
1% of all waves were from the S with heights from 6-7.5 meters
Number of observations
12% of the waves from all directions had heights ≥10 meters
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-5.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
92
95
100
105
107
110
112
98
E
N
S
5
0
3
7
10
1
2
3
4

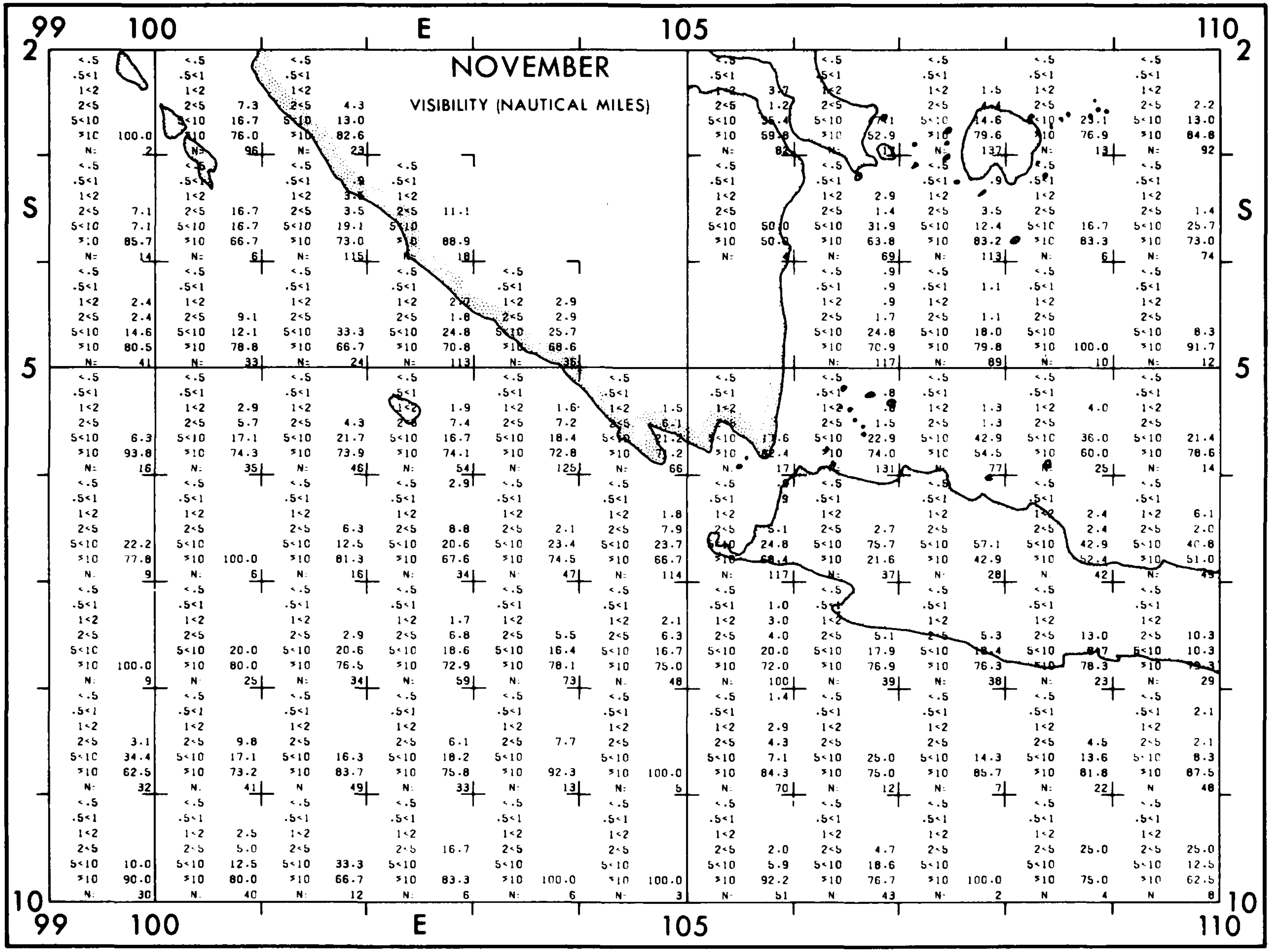

OCTOBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

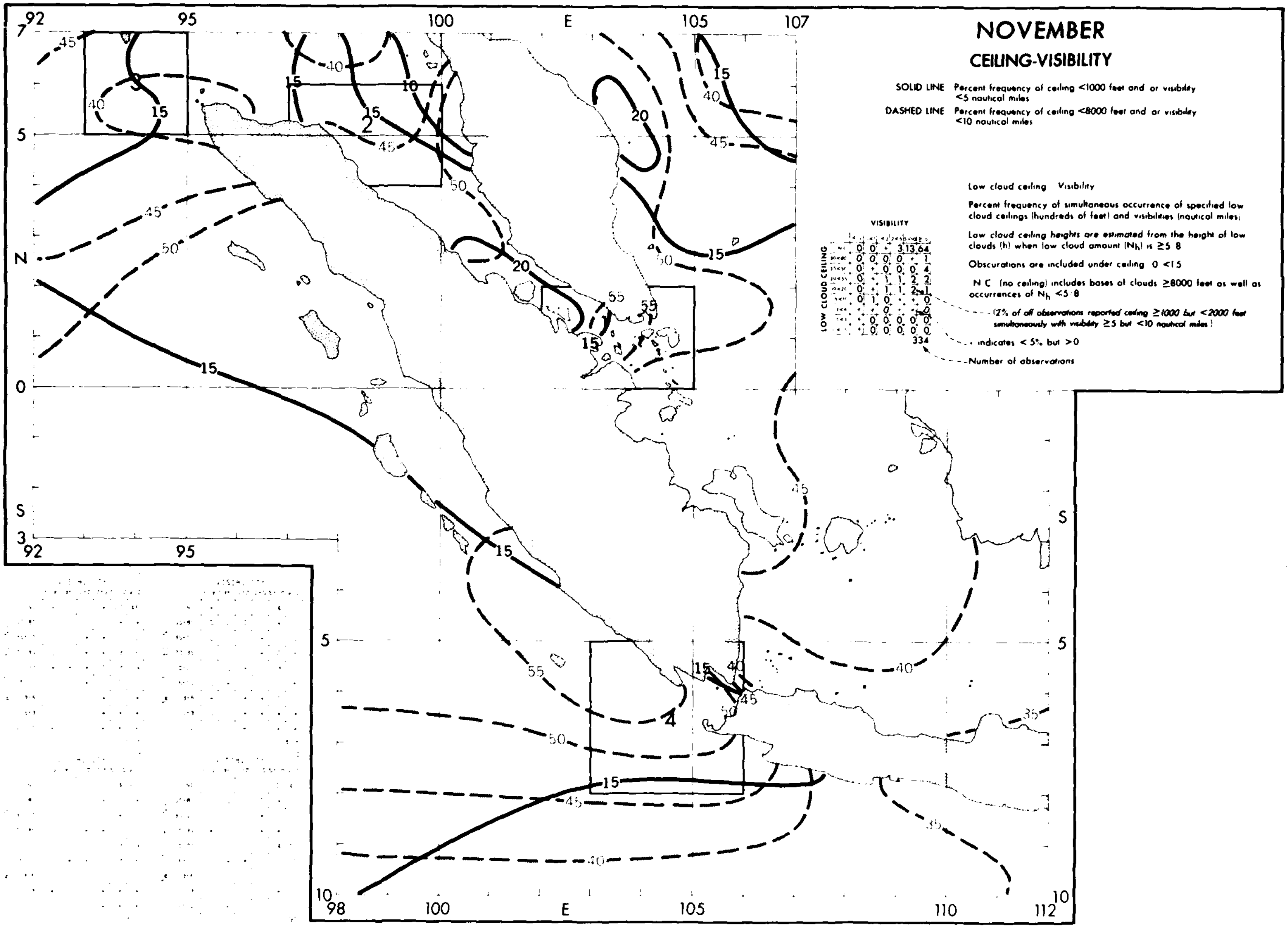

OCTOBER
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10

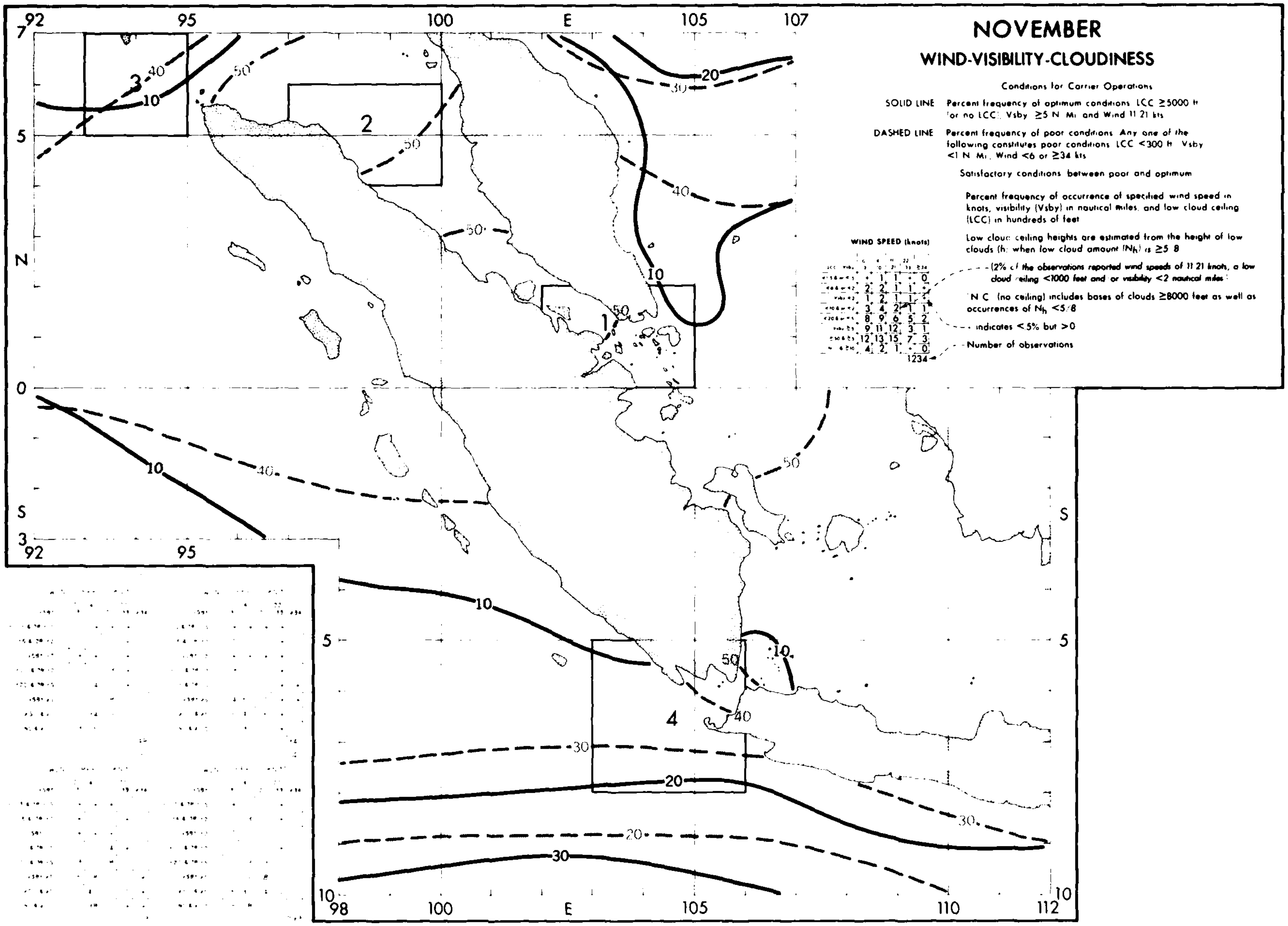

NOVEMBER
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2/8
DASHED LINE Percent frequency of low cloud amount ≥5/8
Total Cloud Amount
Low Cloud Amount
CLOUD AMOUNT IN EIGHTHS
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8)
(46% of all low cloud amounts were ≤2/8)
Low cloud amount: Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
1
2
3
4
1234
1890
3123
3074
2275
N NE E SE S SW W NW C
92
95
100
105
107
110
112
98
E
N
S
0
5
7
10
3
20
30
40
50

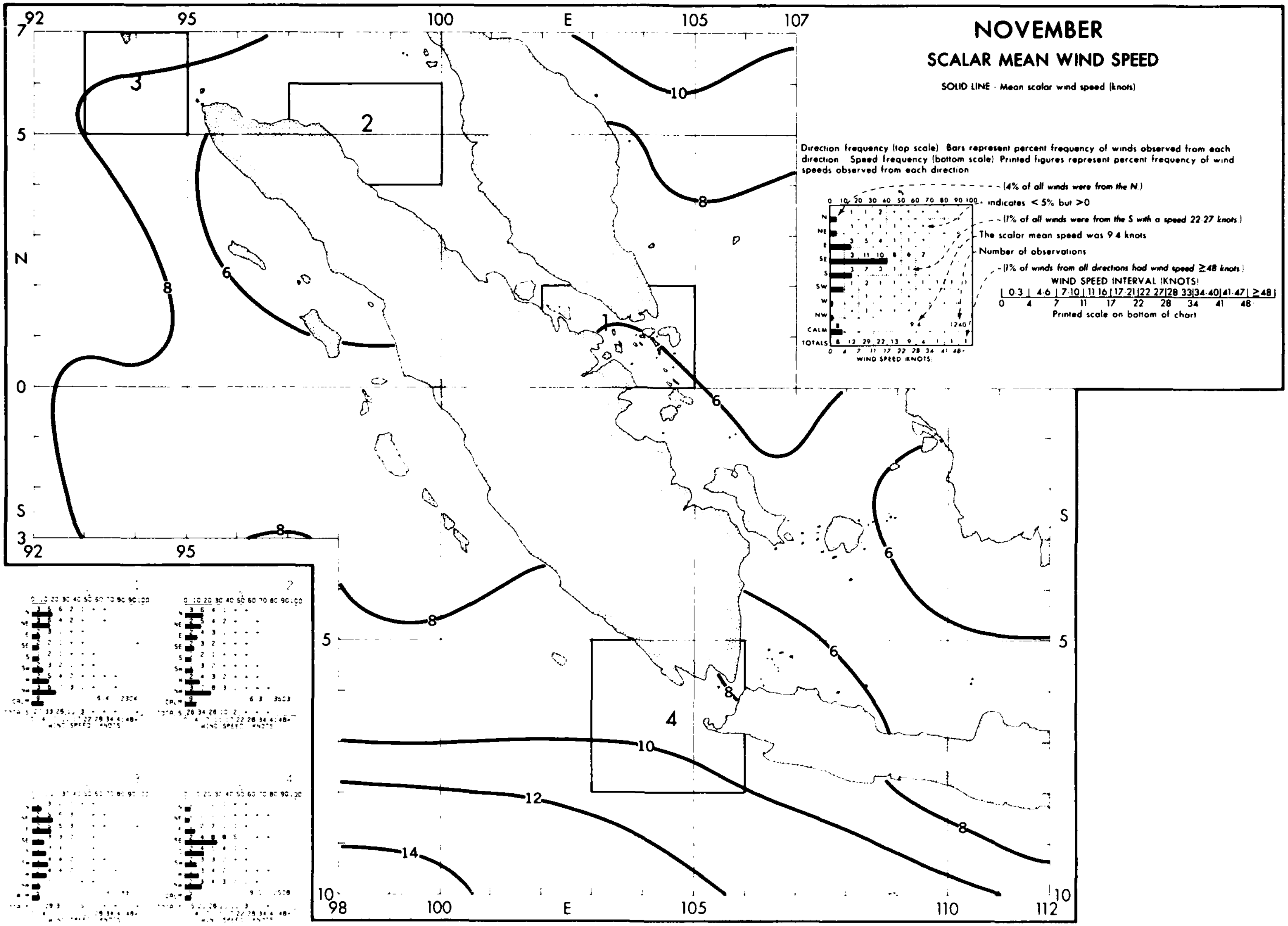

NOVEMBER
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Pcpn
Liquid
Snow
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation subdivided into liquid type including freezing rain and freezing drizzle and snow
Percentage of present weather observations reporting precipitation
Number of observations
34% of all NE winds were accompanied by precipitation of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10 30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
1587
31%
N NE E SE S SW W NW C
1
2
3
4
92
95
100
105
107
110
112
98
E
N
S
7
5
0
3
10
15
20
25
449
362
22%

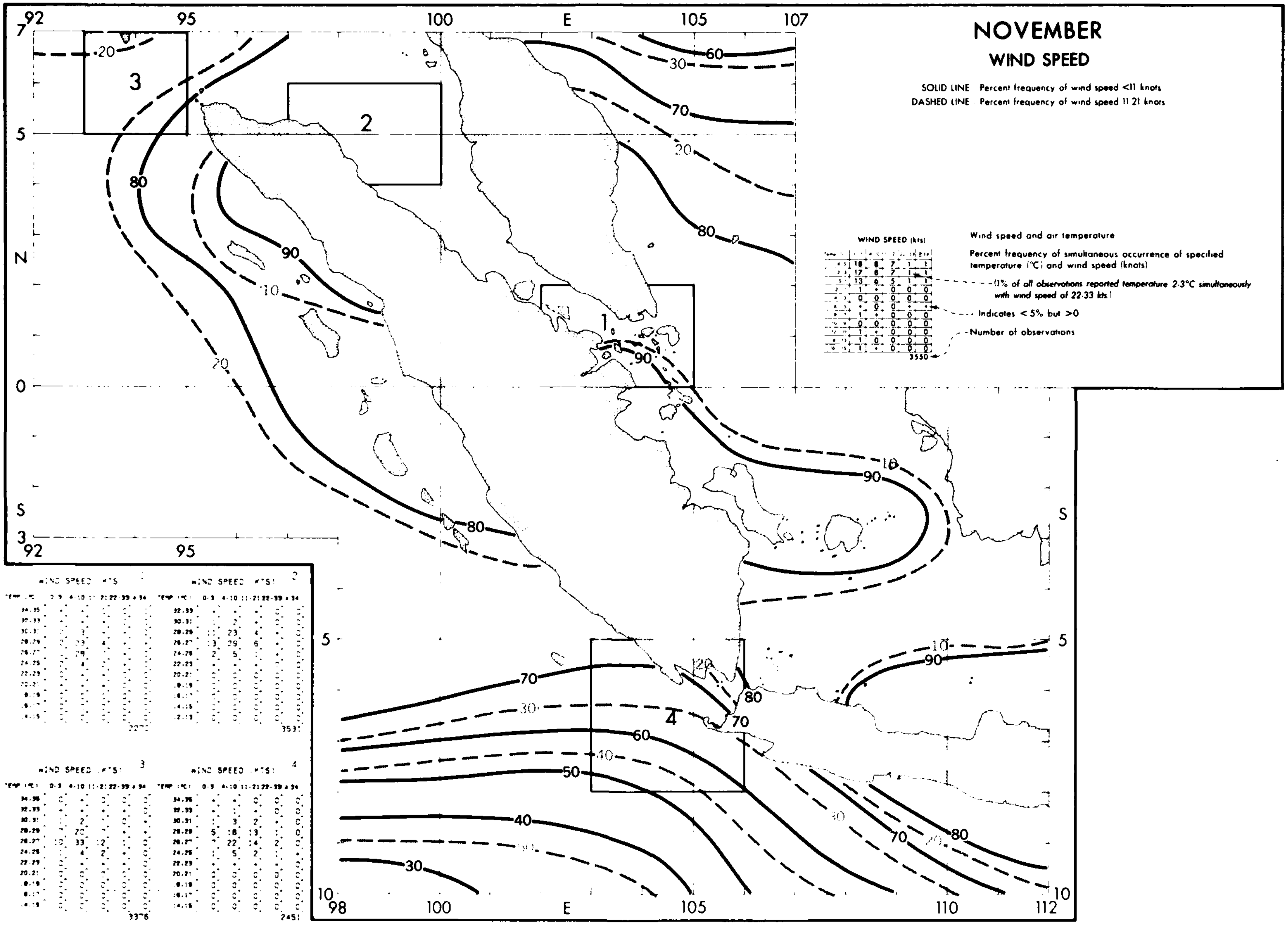

NOVEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1

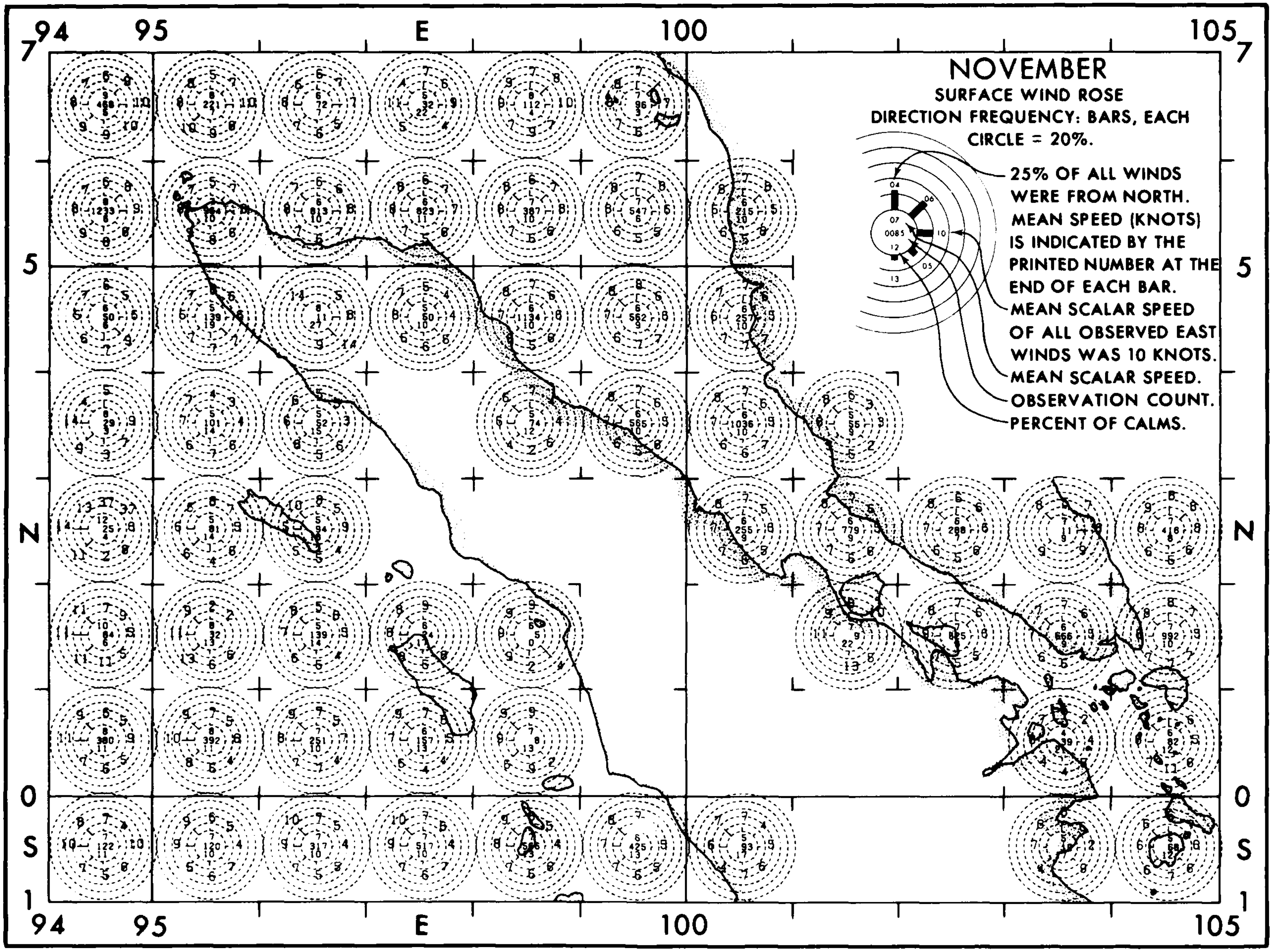

NOVEMBER
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10

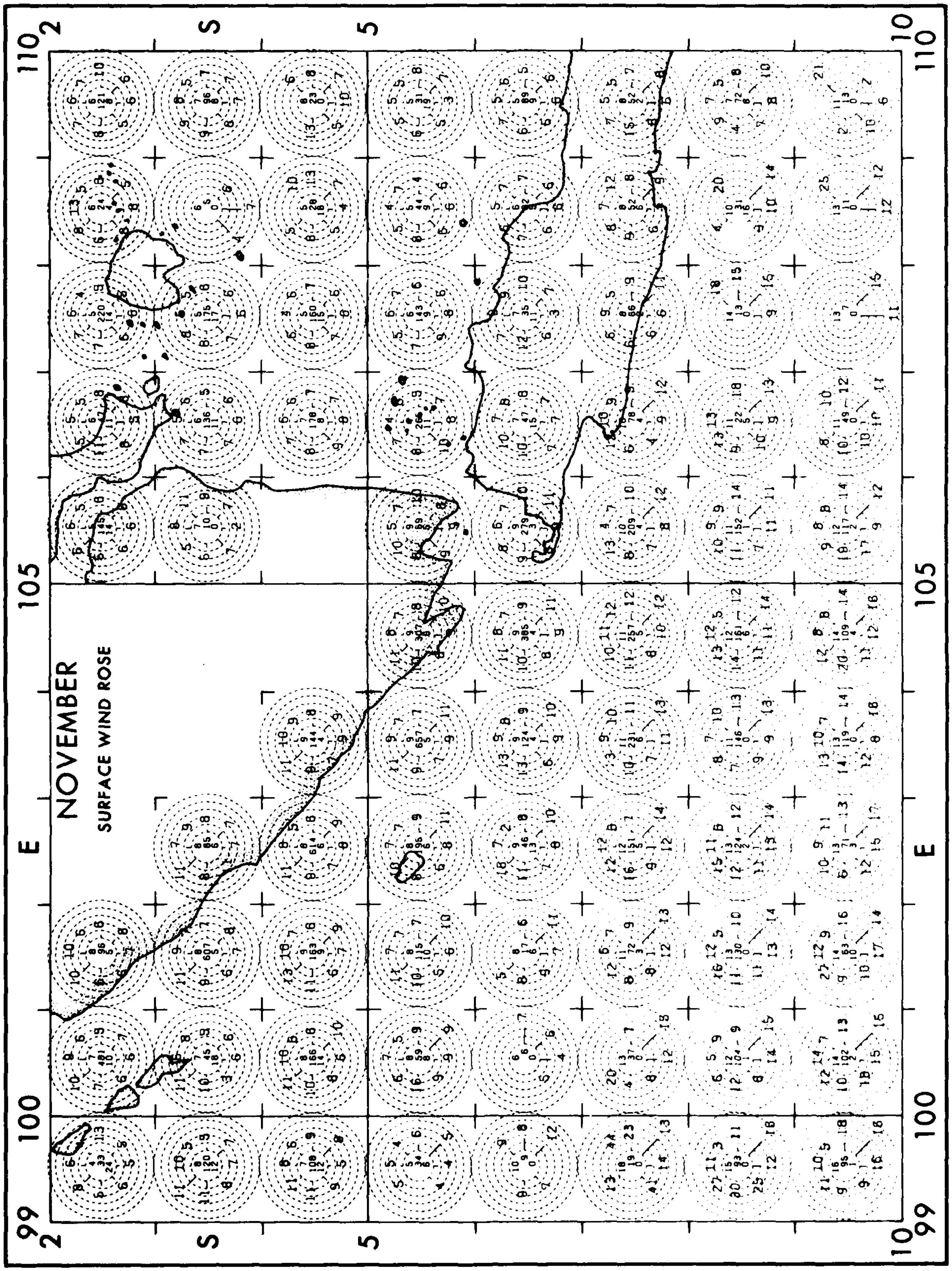

NOVEMBER
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and/or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and/or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (N_h) is ≥5/8
Obscurations are included under ceiling 0 <15
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of N_h <5/8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles)
• indicates < 5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10

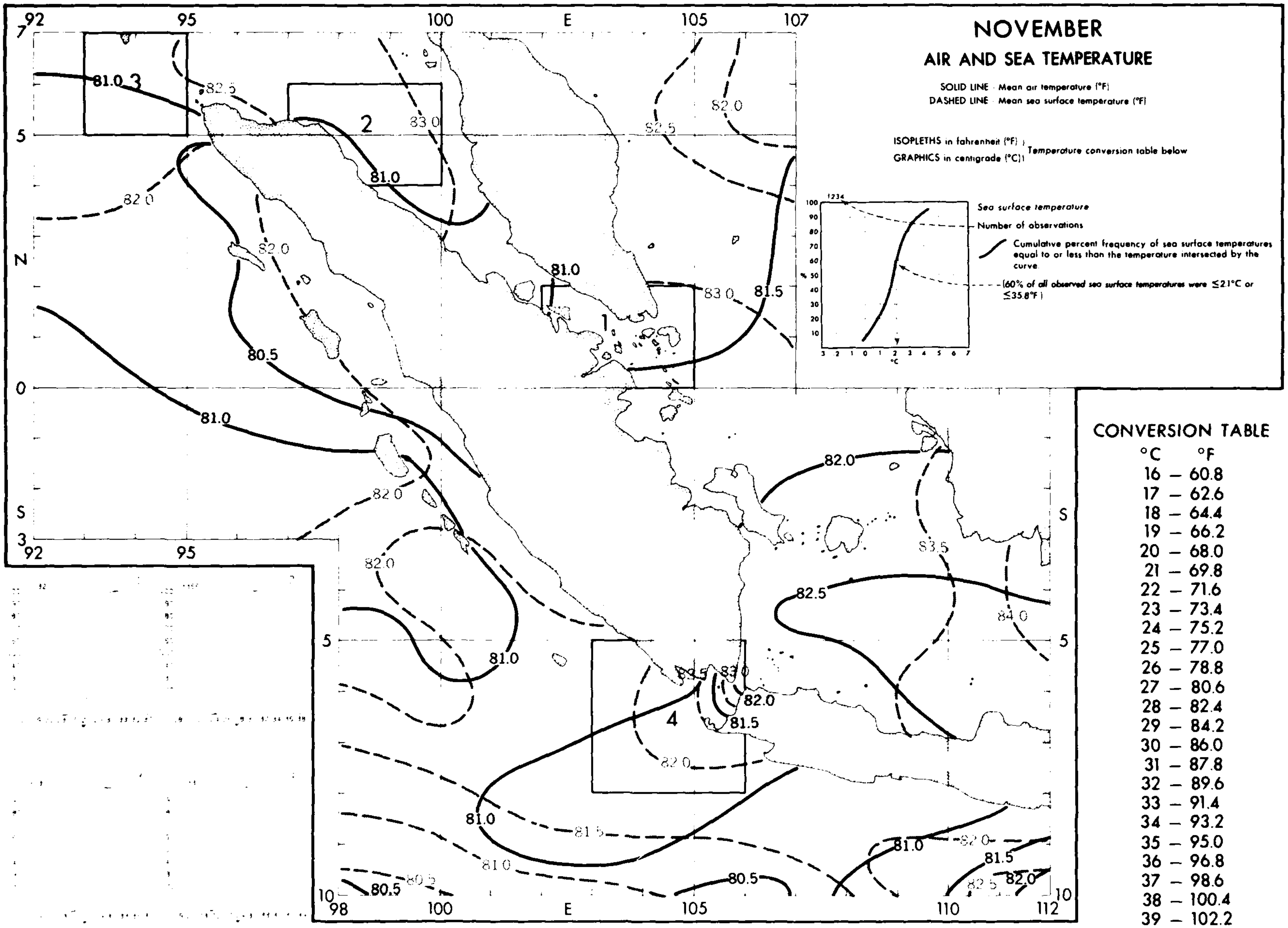

NOVEMBER
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft (or no LCC), Vsby ≥5 N. Mi. and Wind 11-21 kts
DASHED LINE Percent frequency of poor conditions. Any one of the following constitutes poor conditions: LCC <300 ft, Vsby <1 N. Mi., Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles, and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (N_h) is ≥5/8
WIND SPEED (knots)
(2% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and/or visibility <2 nautical miles)
N.C. (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of N_h <5/8
• indicates <5% but >0
Number of observations
1234
1
2
3
4
92
95
100
E
105
107
110
112
98
N
S
0
5
7
3
10
20
30
40
50


NOVEMBER
SCALAR MEAN WIND SPEED
SOLID LINE · Mean scalar wind speed (knots)
Direction frequency (top scale) Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale) Printed figures represent percent frequency of wind speeds observed from each direction
(4% of all winds were from the N.)
indicates < 5% but >0
(1% of all winds were from the S with a speed 22-27 knots)
The scalar mean speed was 9.4 knots
Number of observations
(1% of winds from all directions had wind speed ≥48 knots)
WIND SPEED INTERVAL (KNOTS)
0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 22-27 | 28-33 | 34-40 | 41-47 | ≥48
0 4 7 11 17 22 28 34 41 48
Printed scale on bottom of chart
WIND SPEED (KNOTS)
1
2
3
4
92
95
100
105
107
110
112
98
E
N
S
0
5
7
3
10
6
8
12
14


NOVEMBER
WIND SPEED
SOLID LINE Percent frequency of wind speed <11 knots
DASHED LINE Percent frequency of wind speed 11-21 knots
Wind speed and air temperature
Percent frequency of simultaneous occurrence of specified temperature (°C) and wind speed (knots)
(1% of all observations reported temperature 2-3°C simultaneously with wind speed of 22-33 kts.)
Indicates < 5% but >0
Number of observations
WIND SPEED (kts)
3550

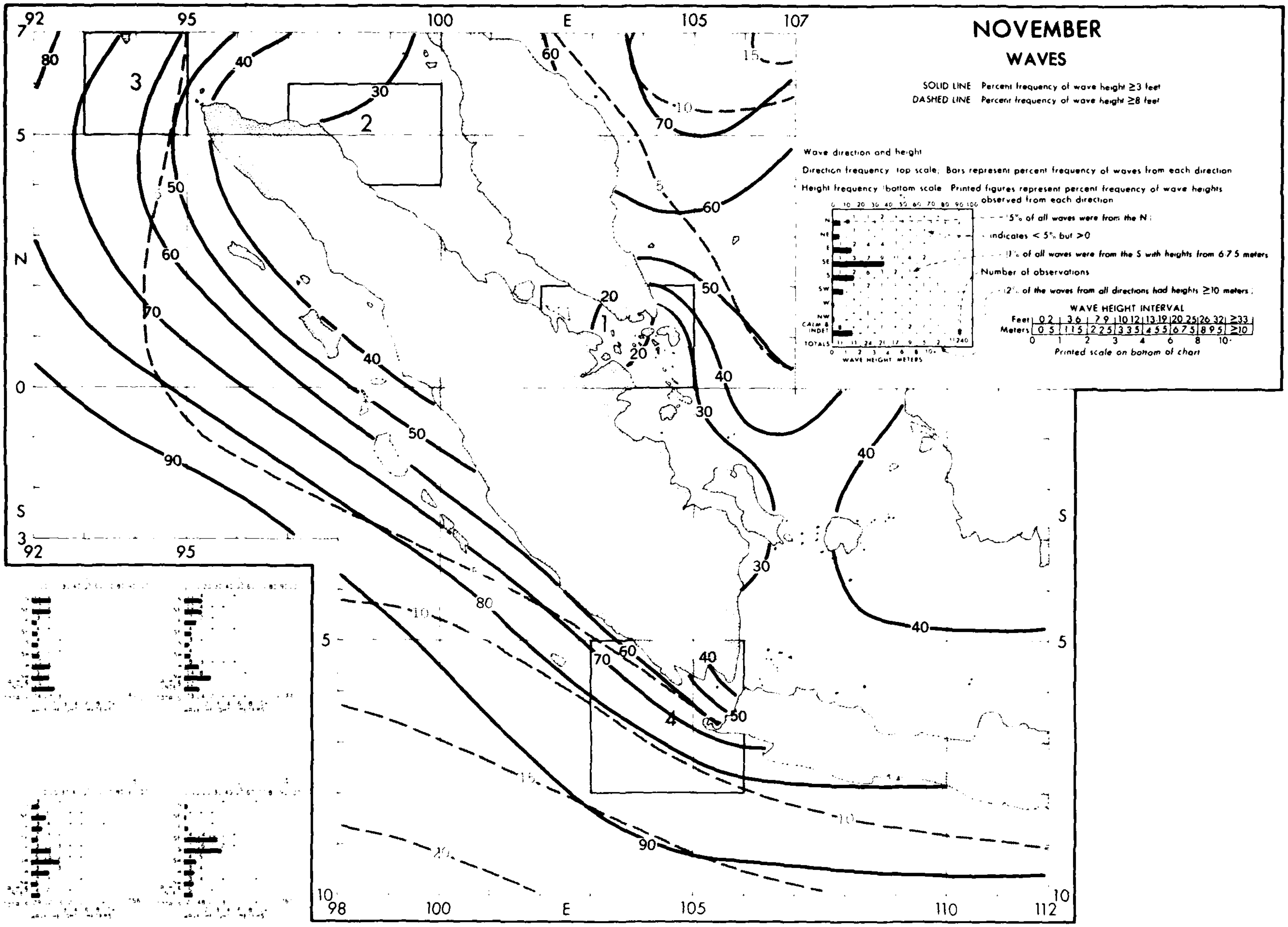

NOVEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
E
100
105
7
5
N
0
S
1

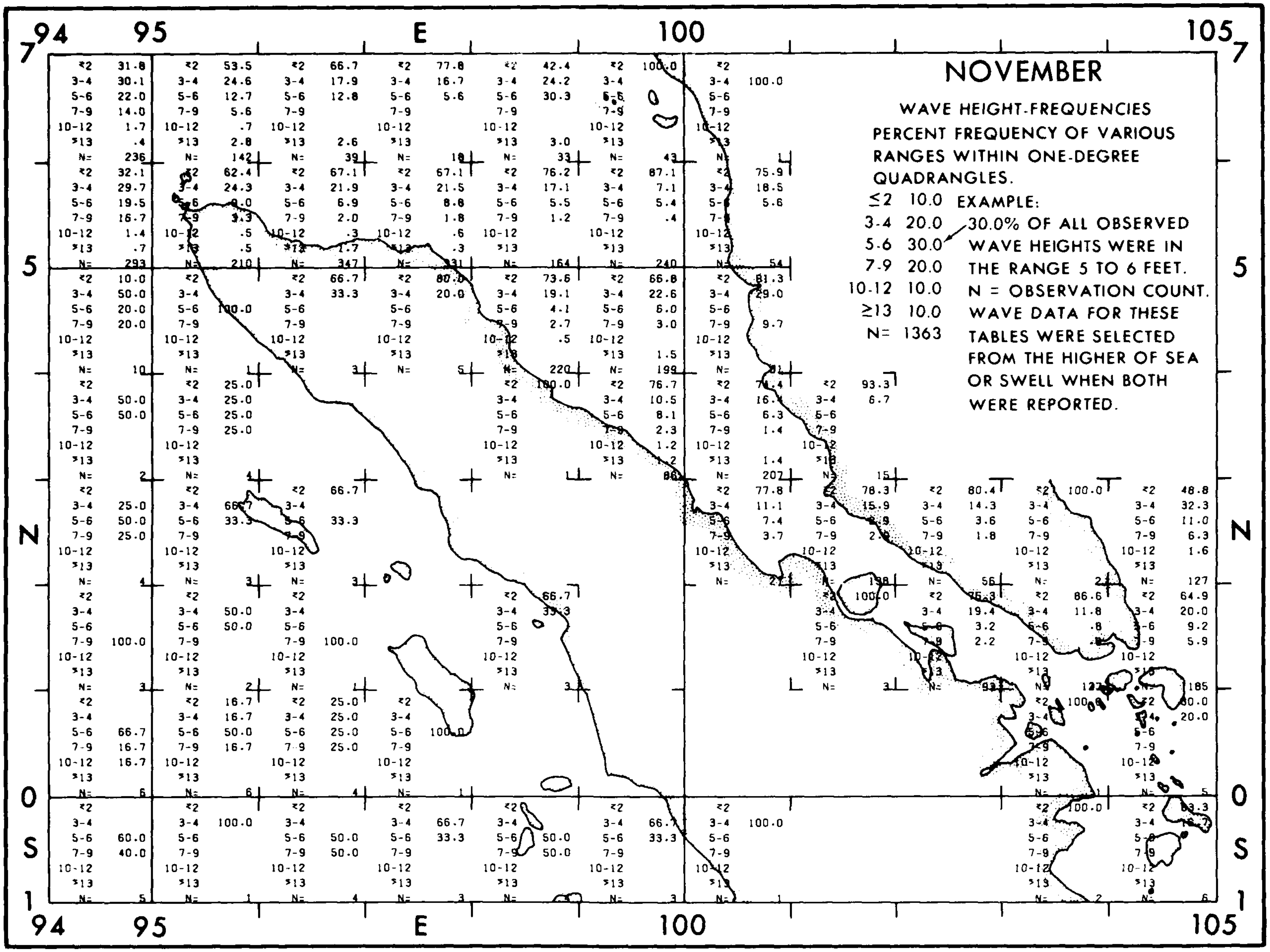

NOVEMBER
SURFACE WIND ROSE

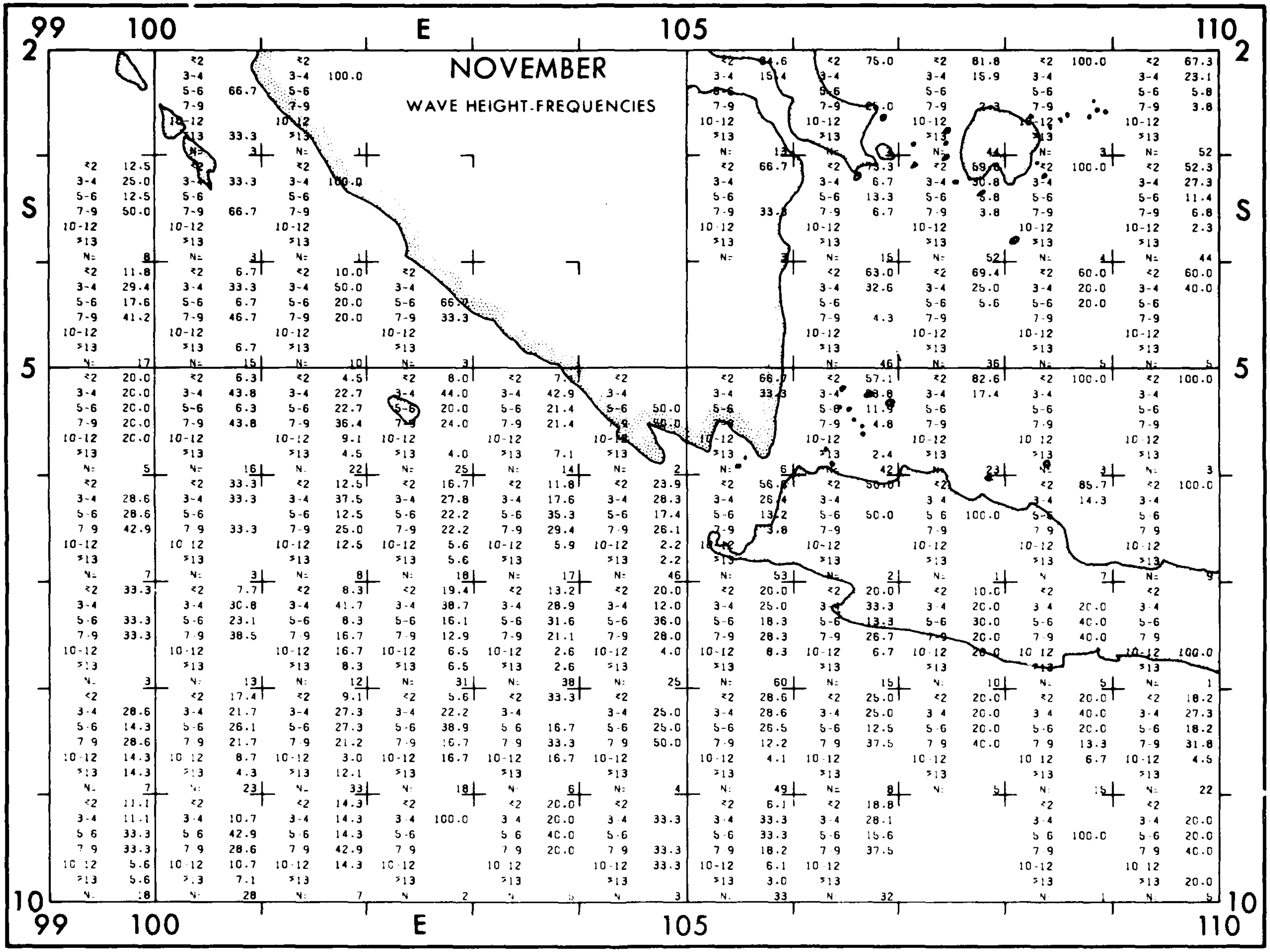


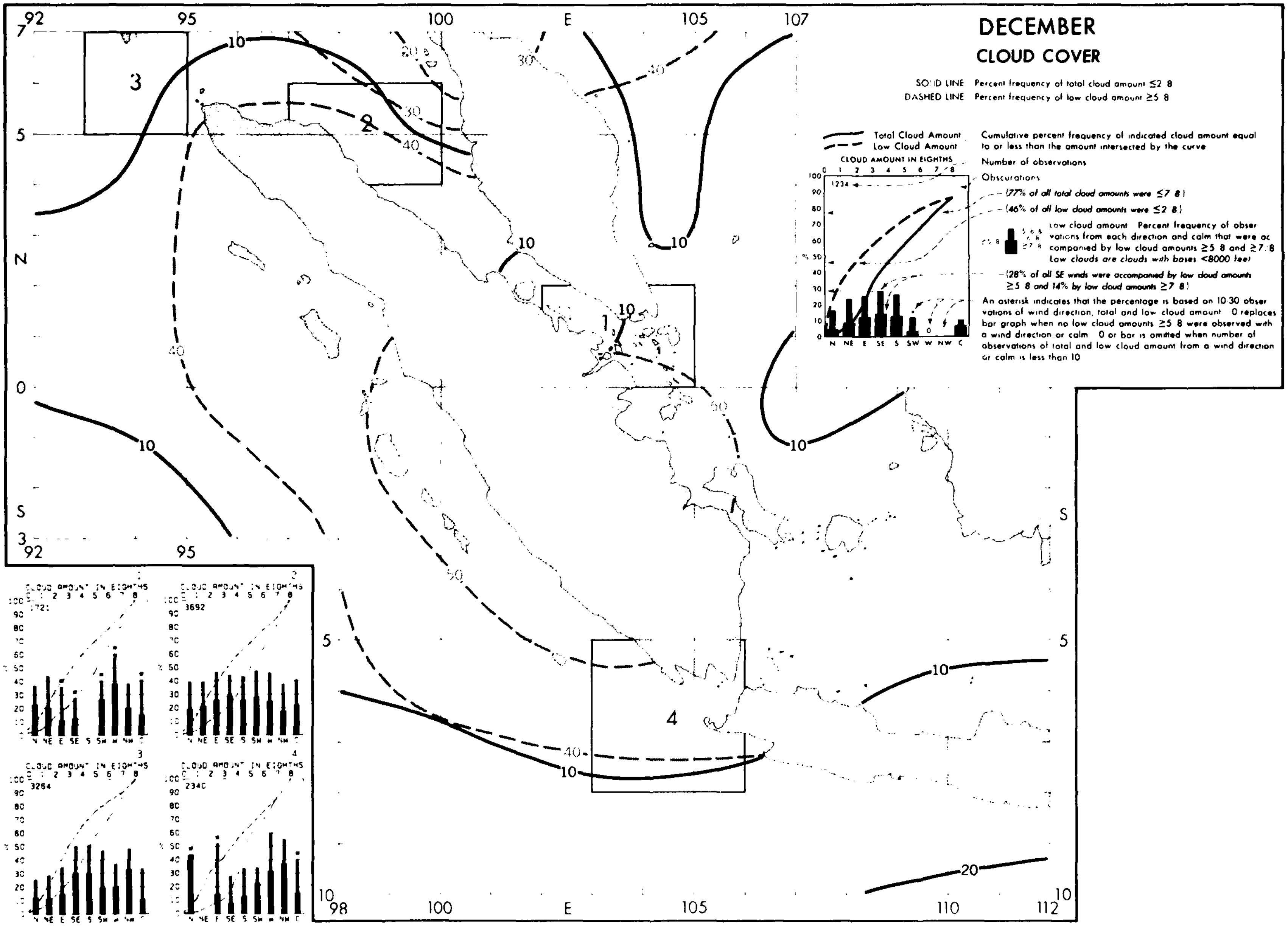
CONVERSION TABLE

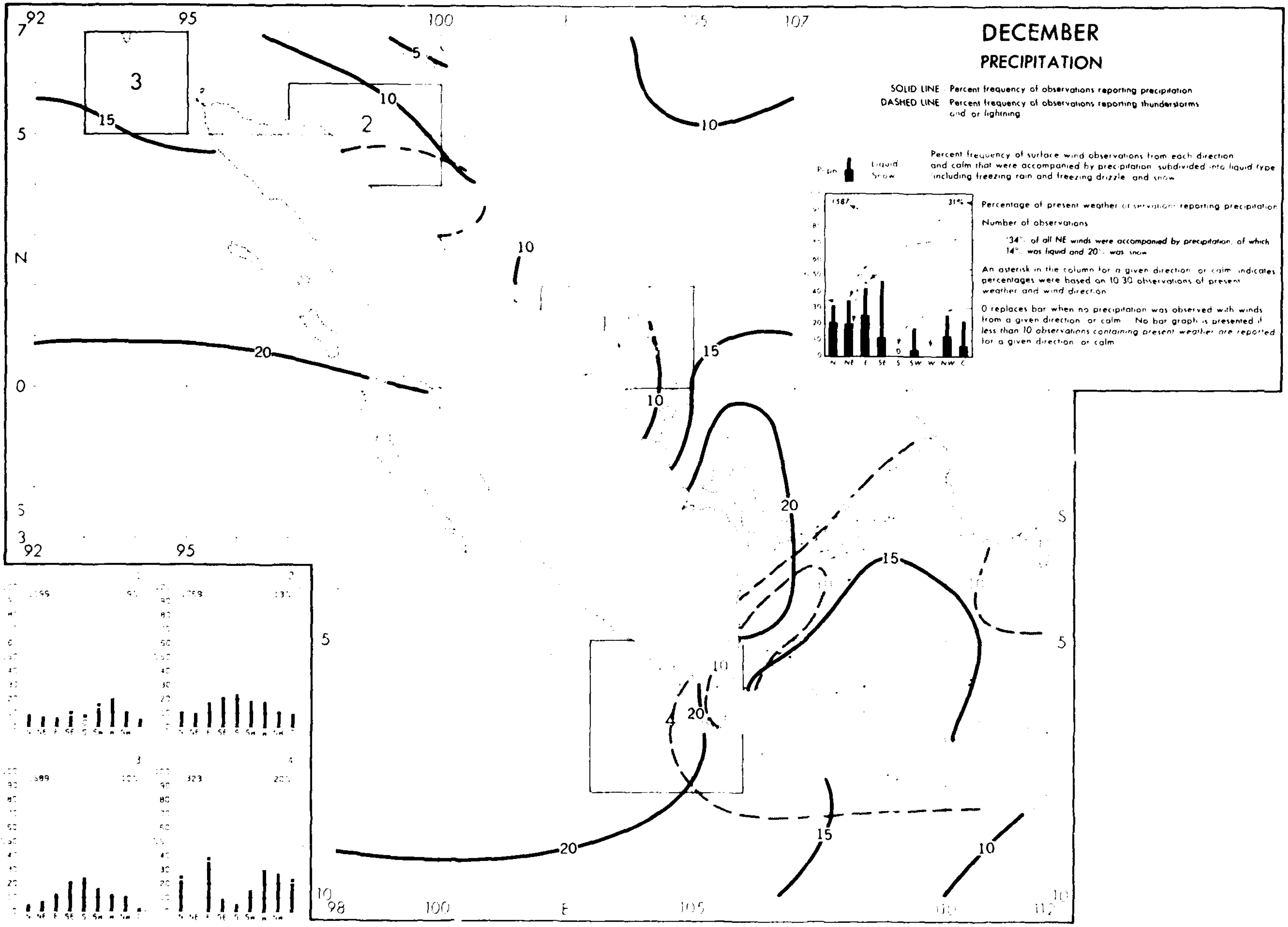
°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2

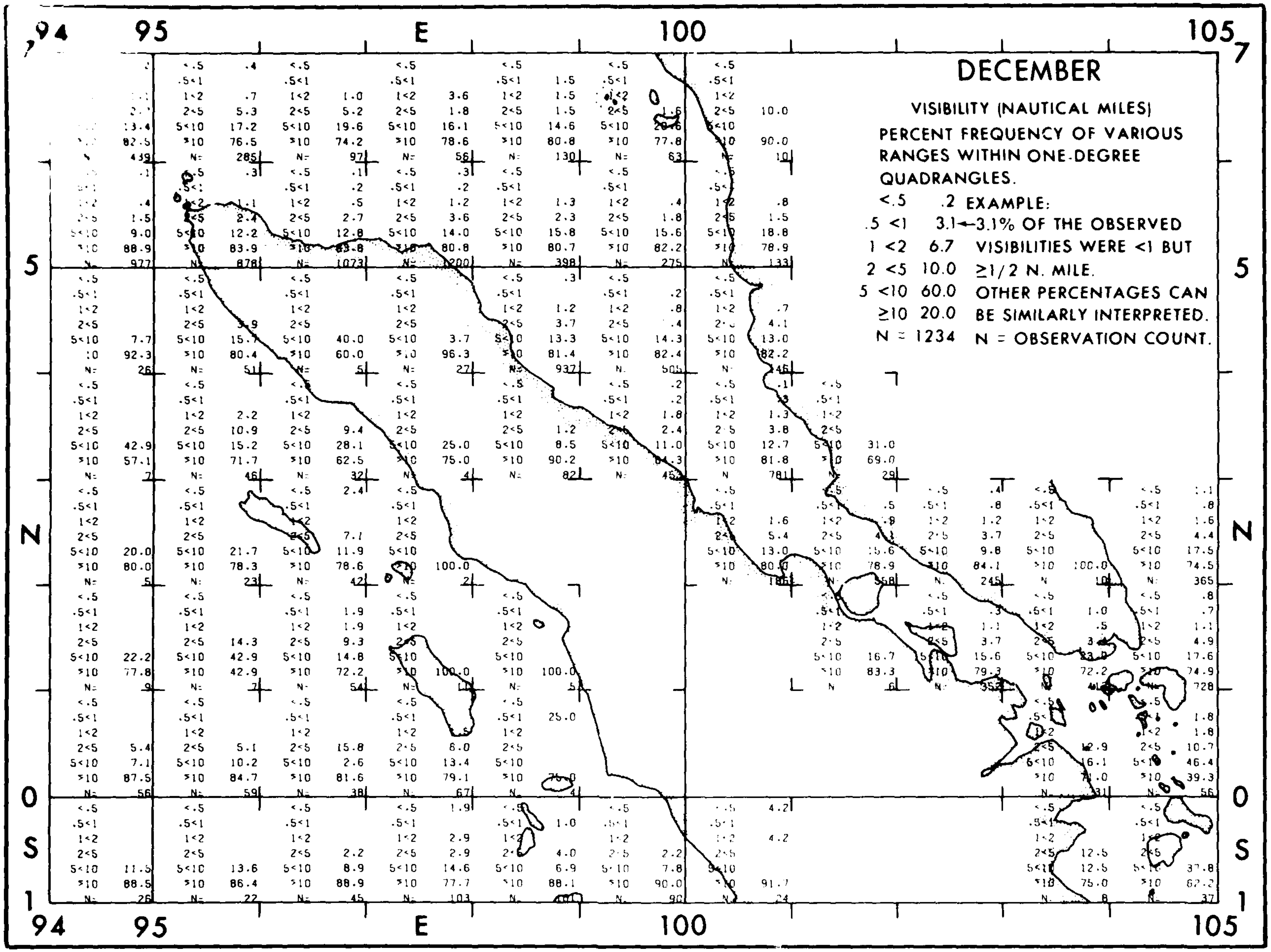

NOVEMBER
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency top scale; Bars represent percent frequency of waves from each direction
Height frequency bottom scale Printed figures represent percent frequency of wave heights observed from each direction
Number of observations
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0.5 1-1.5 2-2.5 3-3.5 4-5.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
WAVE HEIGHT METERS
92 95 100 E 105 107 110 112 98
N S E
1 2 3 4

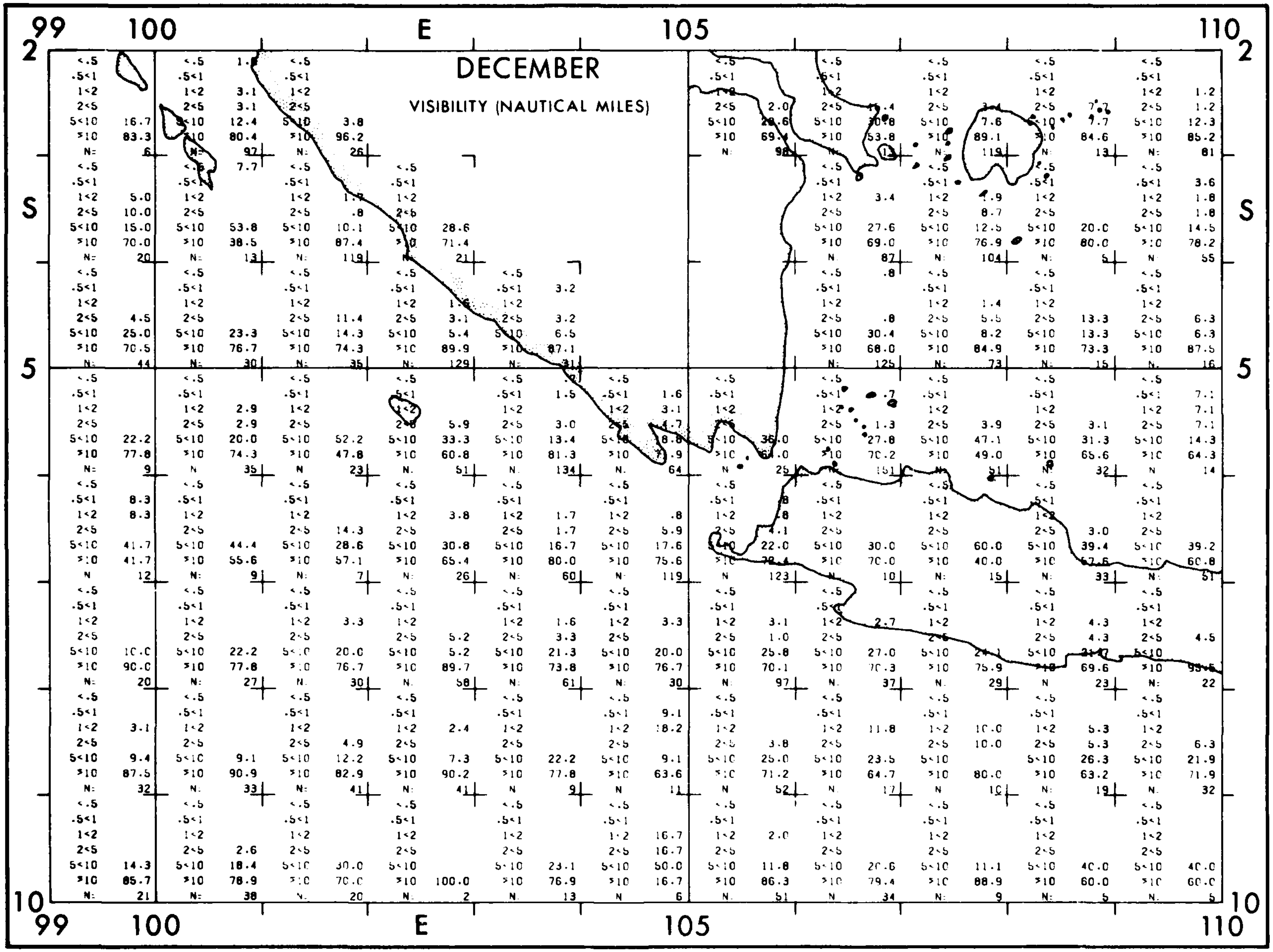

NOVEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1

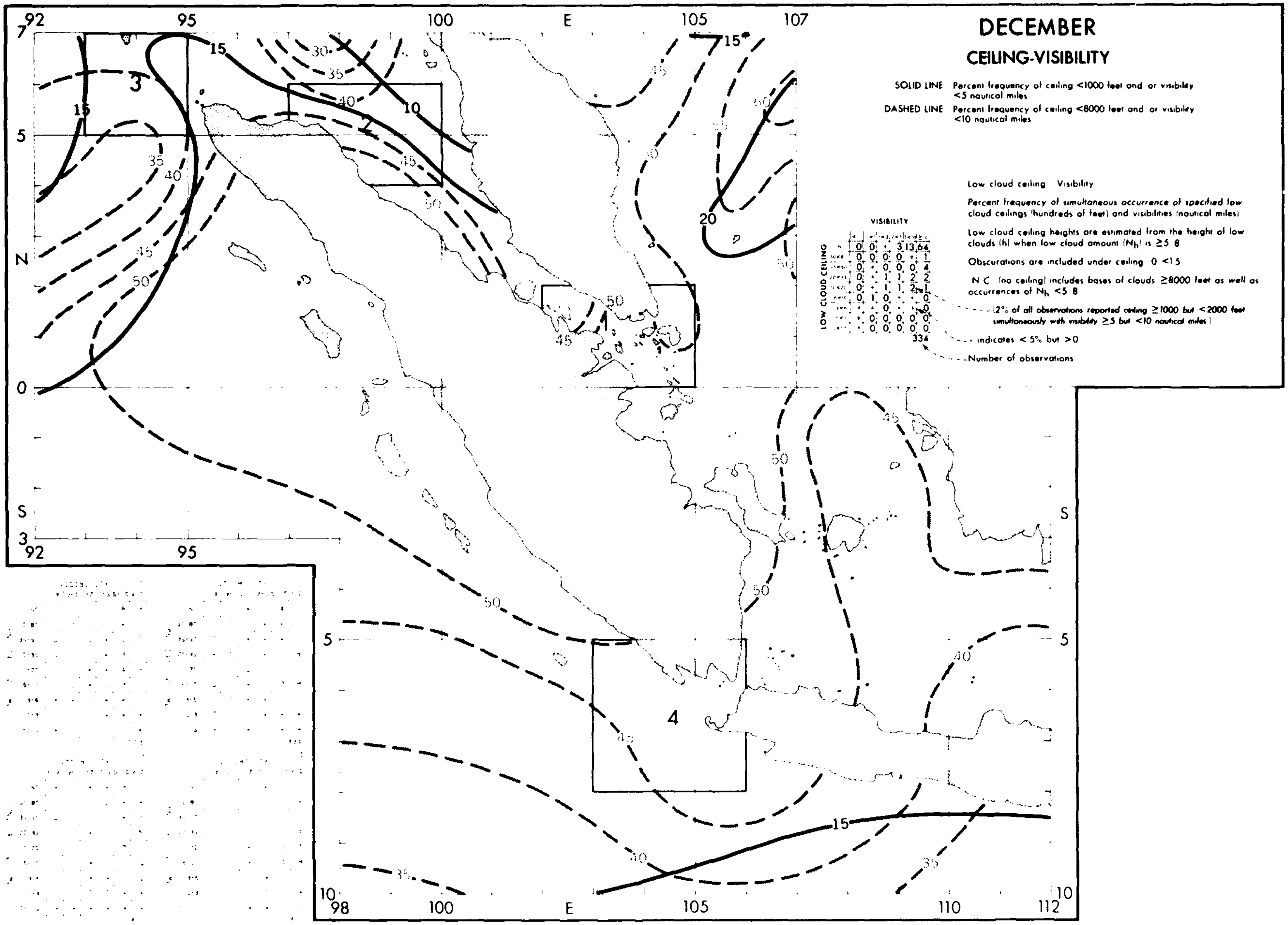

NOVEMBER
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10

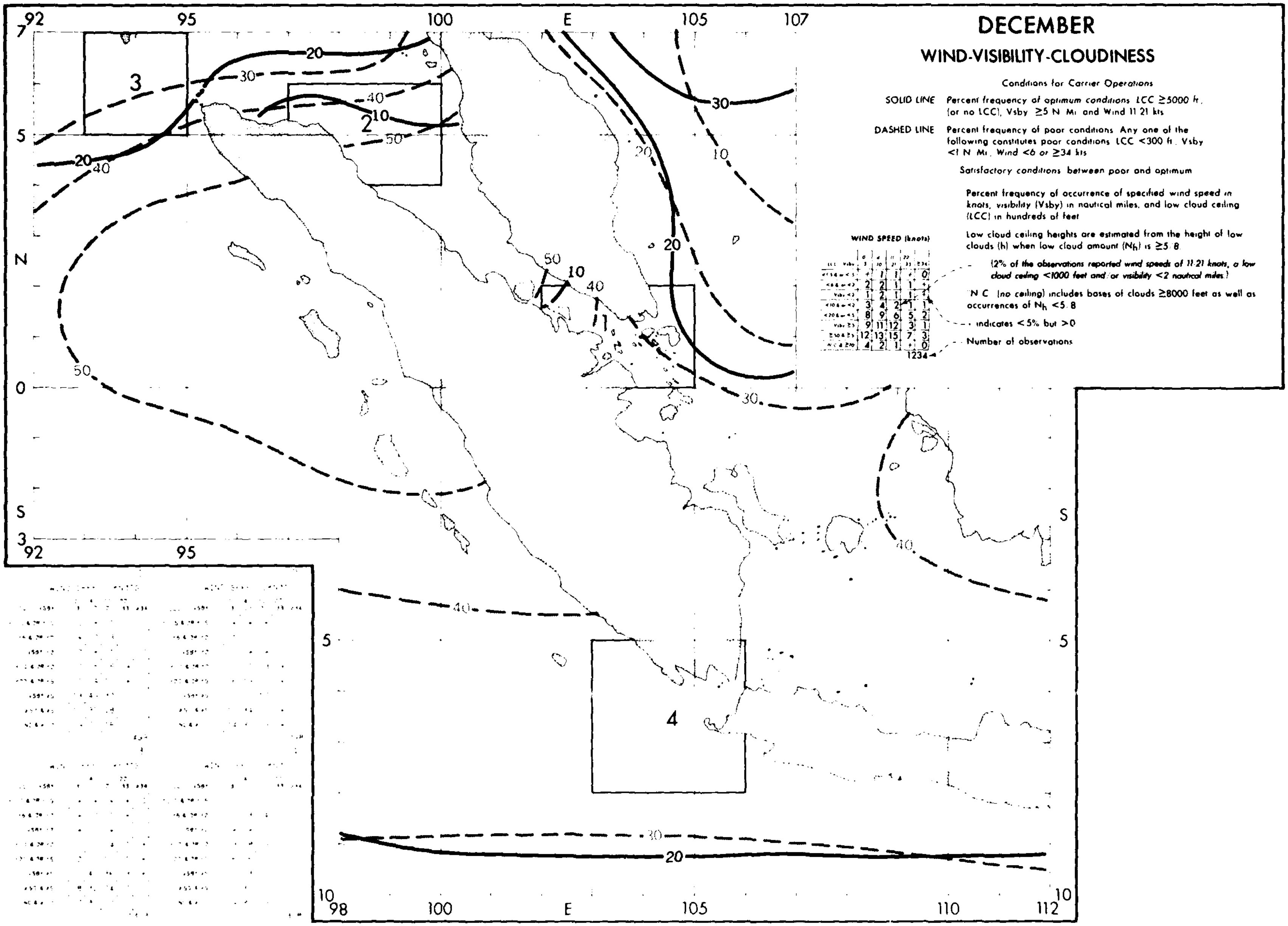

DECEMBER
CLOUD COVER
SOLID LINE Percent frequency of total cloud amount ≤2/8
DASHED LINE Percent frequency of low cloud amount ≥5/8
Total Cloud Amount
Low Cloud Amount
CLOUD AMOUNT IN EIGHTHS
Cumulative percent frequency of indicated cloud amount equal to or less than the amount intersected by the curve
Number of observations
Obscurations
(77% of all total cloud amounts were ≤7/8)
(46% of all low cloud amounts were ≤2/8)
Low cloud amount. Percent frequency of observations from each direction and calm that were accompanied by low cloud amounts ≥5/8 and ≥7/8. Low clouds are clouds with bases <8000 feet
(28% of all SE winds were accompanied by low cloud amounts ≥5/8 and 14% by low cloud amounts ≥7/8)
An asterisk indicates that the percentage is based on 10-30 observations of wind direction, total and low cloud amount. 0 replaces bar graph when no low cloud amounts ≥5/8 were observed with a wind direction or calm. 0 or bar is omitted when number of observations of total and low cloud amount from a wind direction or calm is less than 10
N NE E SE S SW W NW C
1 2 3 4
92 95 100 105 107 110 112 98
E N S
10 20 30 40 50

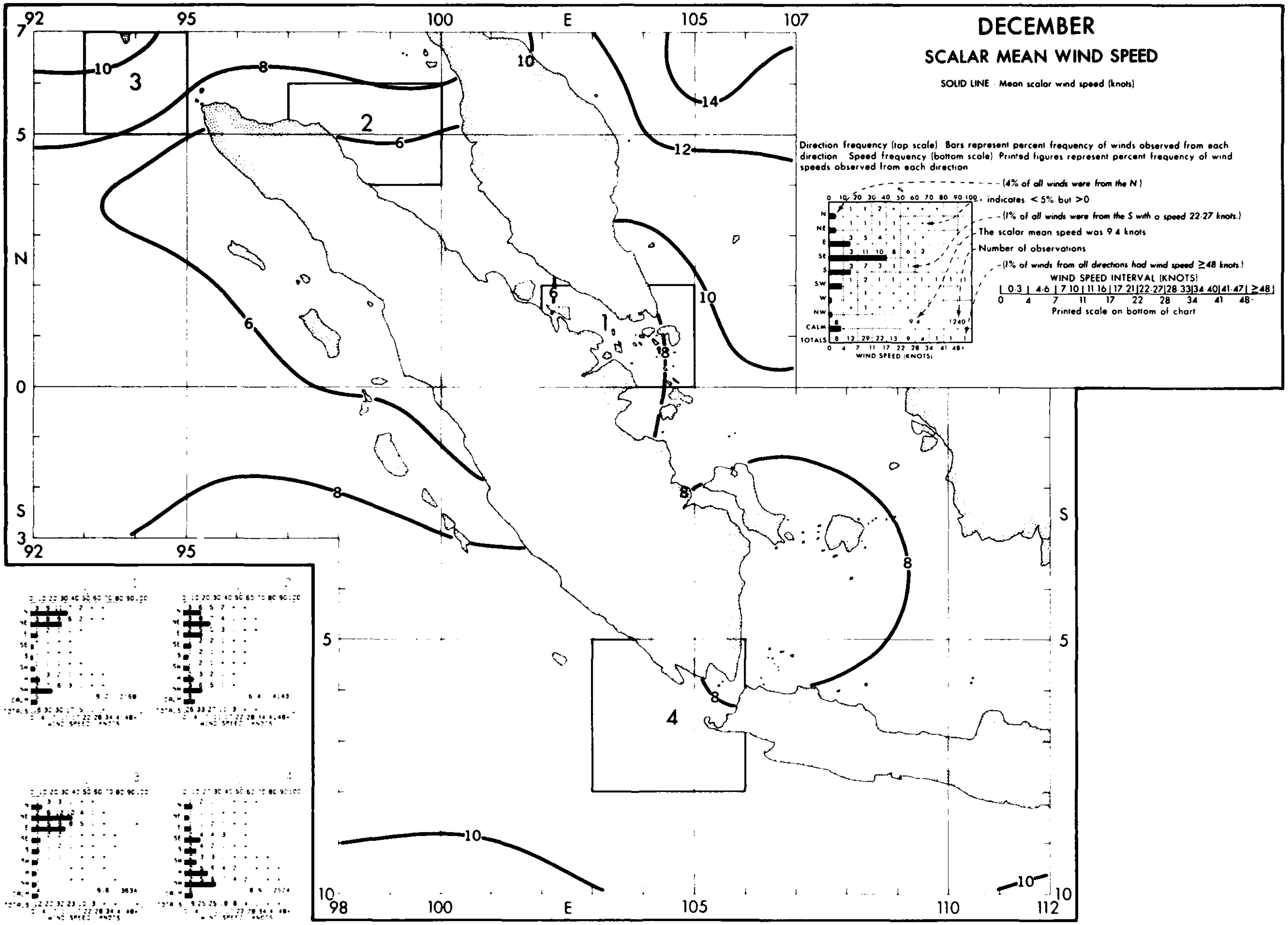

DECEMBER
PRECIPITATION
SOLID LINE Percent frequency of observations reporting precipitation
DASHED LINE Percent frequency of observations reporting thunderstorms and or lightning
Pcpn Liquid Snow
Percent frequency of surface wind observations from each direction and calm that were accompanied by precipitation subdivided into liquid type including freezing rain and freezing drizzle and snow
Percentage of present weather observations reporting precipitation
Number of observations
"34"% of all NE winds were accompanied by precipitation, of which 14% was liquid and 20% was snow
An asterisk in the column for a given direction or calm indicates percentages were based on 10 30 observations of present weather and wind direction
0 replaces bar when no precipitation was observed with winds from a given direction or calm. No bar graph is presented if less than 10 observations containing present weather are reported for a given direction or calm
1587
31%
N NE E SE S SW W NW C
3
2
1
4
389
323
20
15
10
5
92
95
100
105
107
98
110
112
N
0
S
E

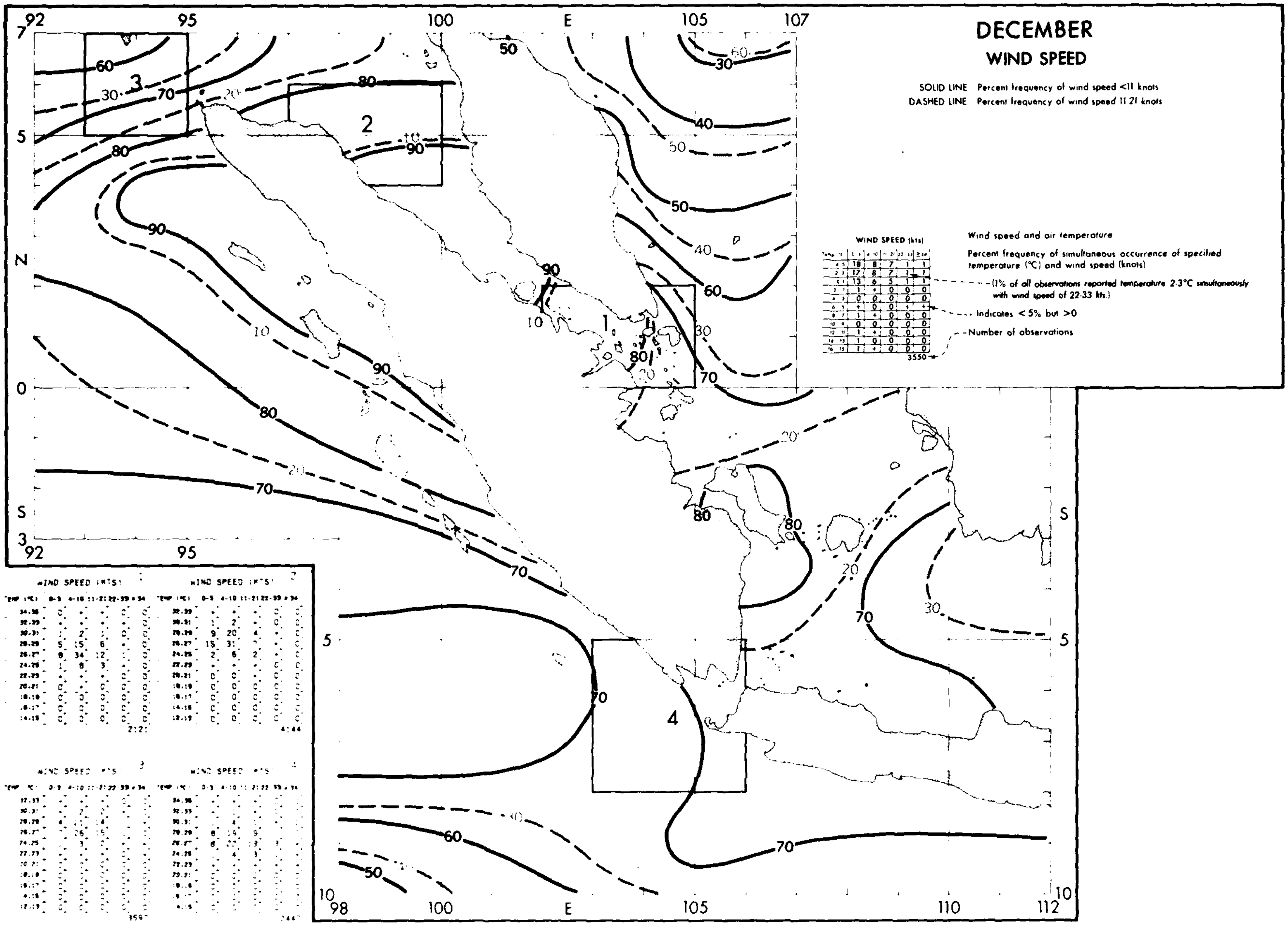

DECEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
94
95
E
100
105
7
5
N
0
S
1

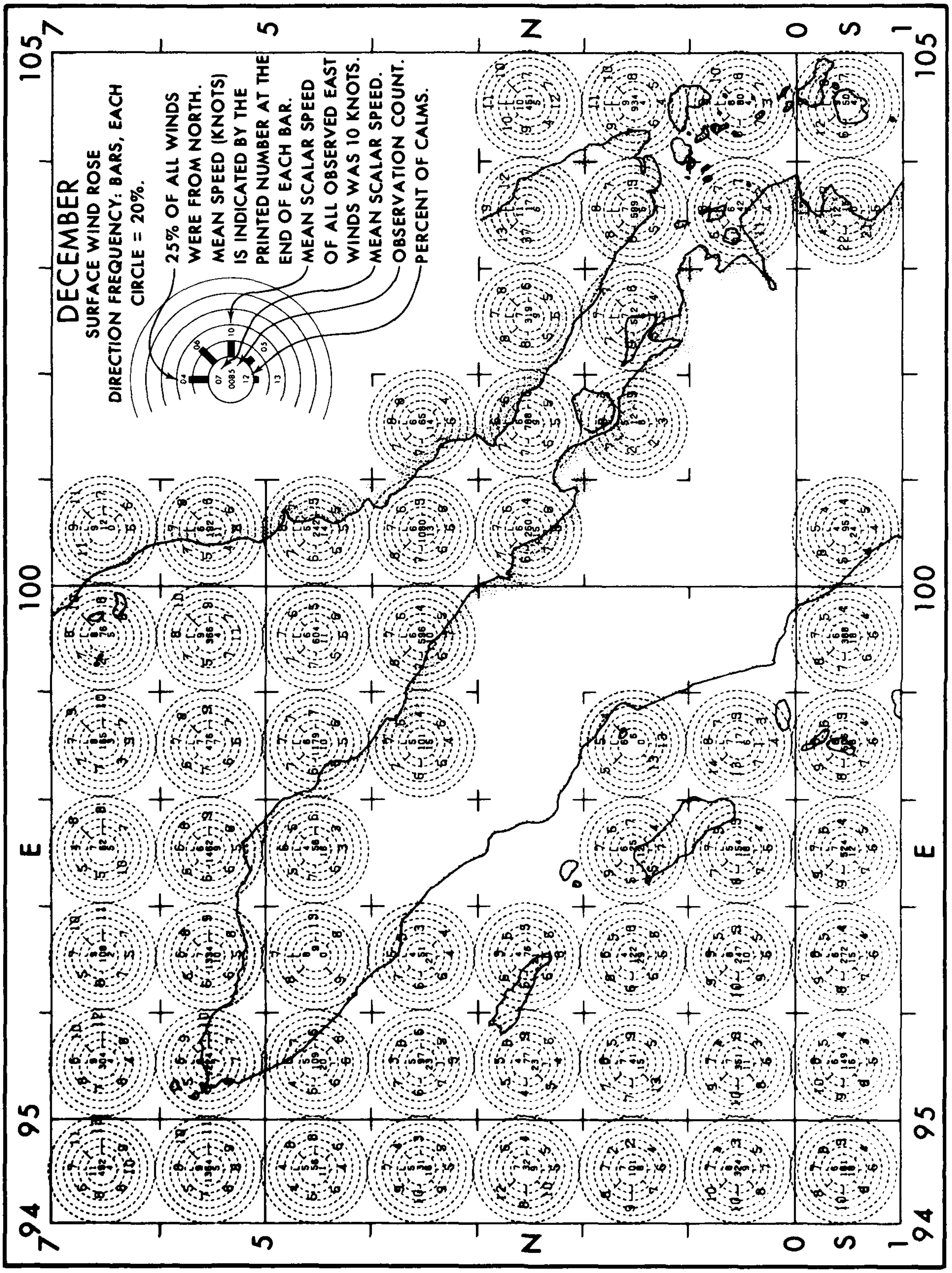

DECEMBER
VISIBILITY (NAUTICAL MILES)
99
100
E
105
110
2
S
5
10


DECEMBER
CEILING-VISIBILITY
SOLID LINE Percent frequency of ceiling <1000 feet and or visibility <5 nautical miles
DASHED LINE Percent frequency of ceiling <8000 feet and or visibility <10 nautical miles
Low cloud ceiling Visibility
Percent frequency of simultaneous occurrence of specified low cloud ceilings (hundreds of feet) and visibilities (nautical miles)
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8
Obscurations are included under ceiling 0 <1.5
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
(2% of all observations reported ceiling ≥1000 but <2000 feet simultaneously with visibility ≥5 but <10 nautical miles)
· indicates <5% but >0
Number of observations
VISIBILITY
LOW CLOUD CEILING
334
92
95
100
E
105
107
110
112
98
N
S
E
0
5
7
3
10
1
2
3
4

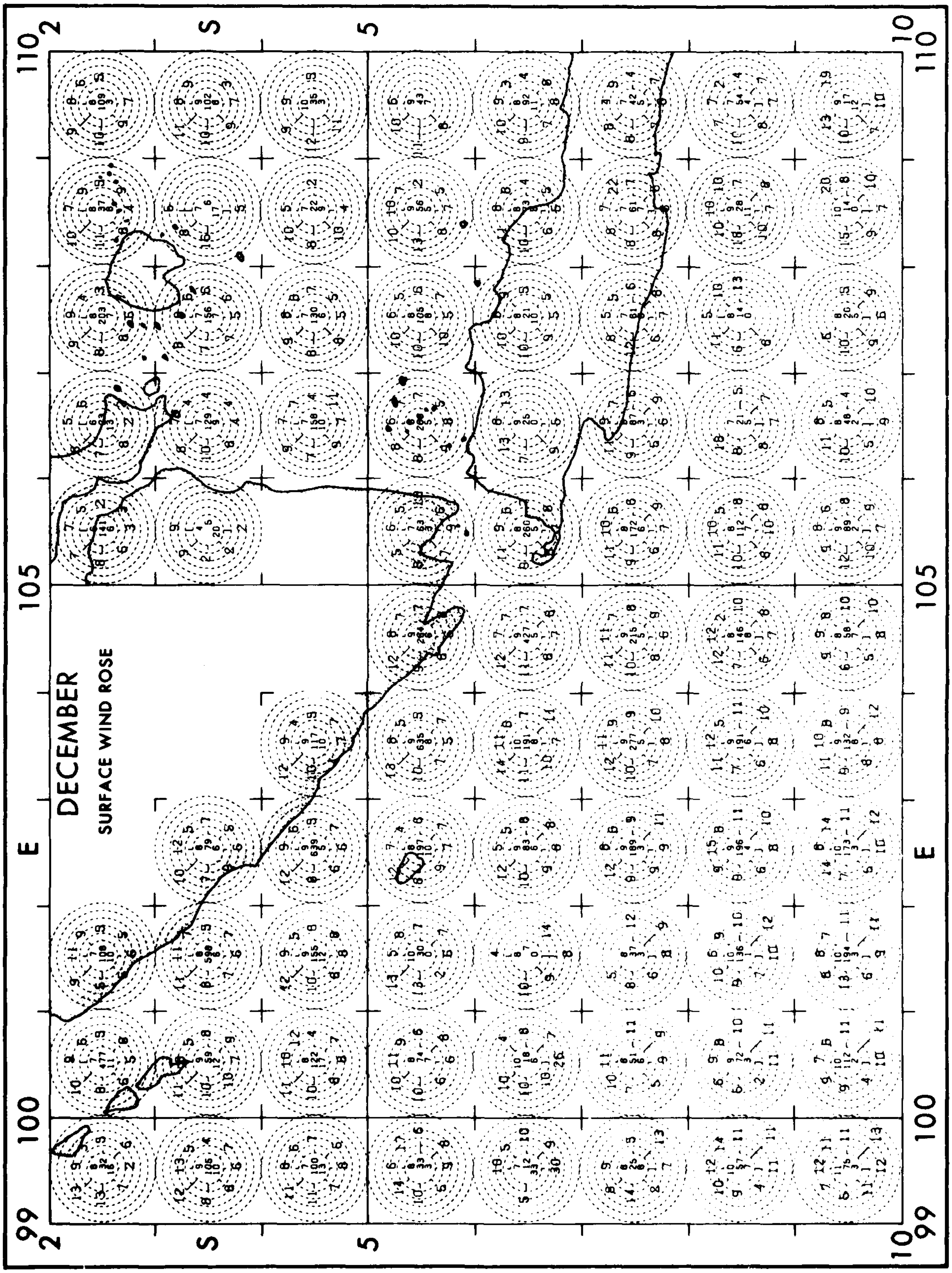

DECEMBER
WIND-VISIBILITY-CLOUDINESS
Conditions for Carrier Operations
SOLID LINE Percent frequency of optimum conditions LCC ≥5000 ft. (or no LCC), Vsby ≥5 N Mi and Wind 11 21 kts
DASHED LINE Percent frequency of poor conditions Any one of the following constitutes poor conditions LCC <300 ft. Vsby <1 N Mi. Wind <6 or ≥34 kts
Satisfactory conditions between poor and optimum
Percent frequency of occurrence of specified wind speed in knots, visibility (Vsby) in nautical miles, and low cloud ceiling (LCC) in hundreds of feet
Low cloud ceiling heights are estimated from the height of low clouds (h) when low cloud amount (Nh) is ≥5 8.
(2% of the observations reported wind speeds of 11-21 knots, a low cloud ceiling <1000 feet and/or visibility <2 nautical miles.)
N C (no ceiling) includes bases of clouds ≥8000 feet as well as occurrences of Nh <5 8
+ indicates <5% but >0
Number of observations
WIND SPEED (knots)
1234
92
95
100
E
105
107
110
112
98
7
5
N
0
S
3
10
1
2
3
4
10
20
30
40
50

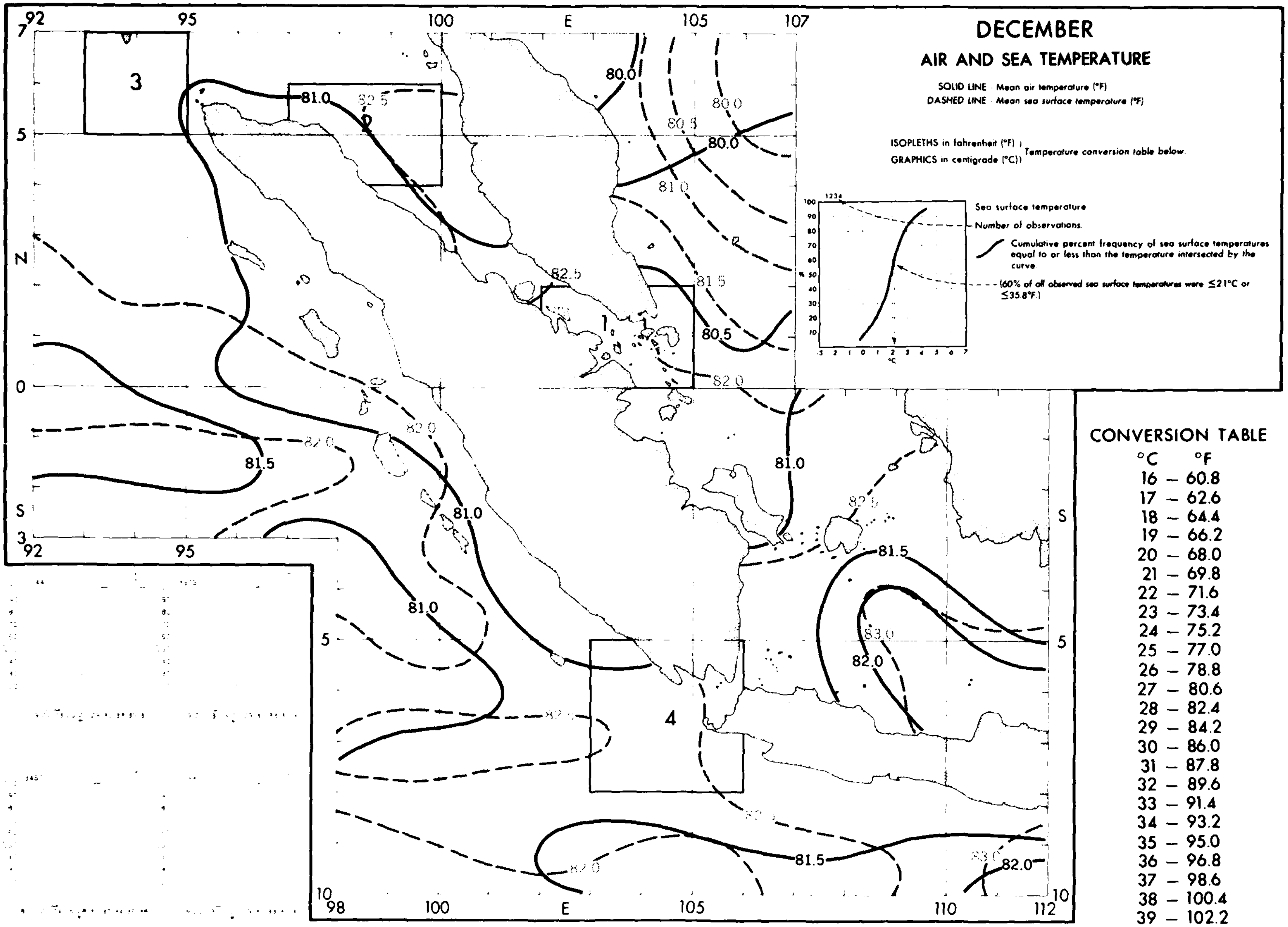

DECEMBER
SCALAR MEAN WIND SPEED
SOLID LINE · Mean scalar wind speed (knots)
Direction frequency (top scale) Bars represent percent frequency of winds observed from each direction. Speed frequency (bottom scale) Printed figures represent percent frequency of wind speeds observed from each direction
(4% of all winds were from the N)
indicates < 5% but > 0
(1% of all winds were from the S with a speed 22-27 knots.)
The scalar mean speed was 9.4 knots
Number of observations
(1% of winds from all directions had wind speed ≥48 knots.)
WIND SPEED INTERVAL (KNOTS)
0-3 | 4-6 | 7-10 | 11-16 | 17-21 | 22-27 | 28-33 | 34-40 | 41-47 | ≥48
0 4 7 11 17 22 28 34 41 48+
Printed scale on bottom of chart
WIND SPEED (KNOTS)
N
NE
E
SE
S
SW
W
NW
CALM
TOTALS
92
95
100
105
107
110
112
98
E
N
S
0
5
7
3
10
1
2
3
4


DECEMBER
WIND SPEED
SOLID LINE Percent frequency of wind speed <11 knots
DASHED LINE Percent frequency of wind speed 11-21 knots
Wind speed and air temperature
Percent frequency of simultaneous occurrence of specified temperature (°C) and wind speed (knots)
(1% of all observations reported temperature 2-3°C simultaneously with wind speed of 22-33 kts)
Indicates < 5% but >0
Number of observations
WIND SPEED (KTS)



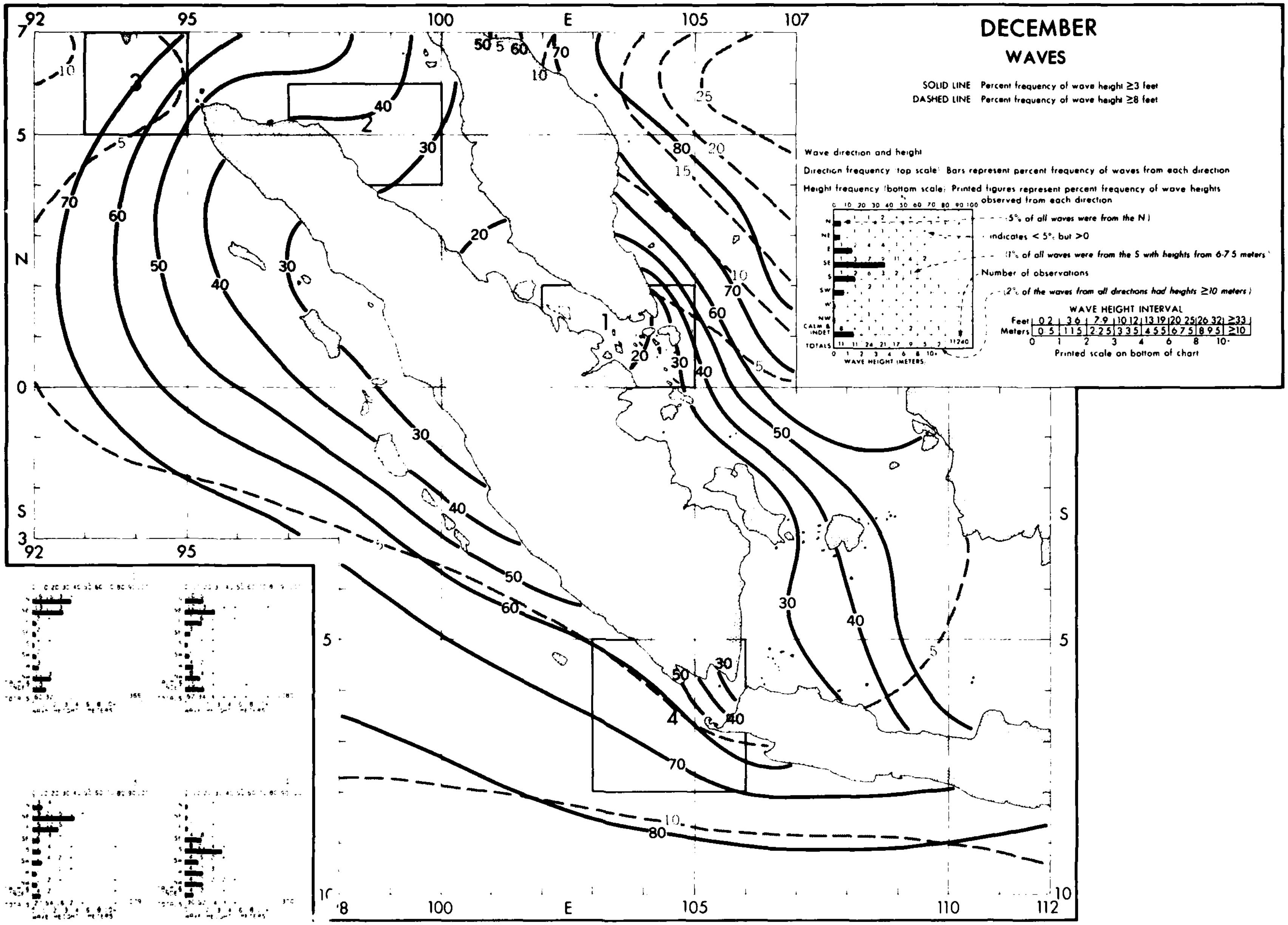
DECEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
94
95
100
105
E
N
S
0
5
7
1

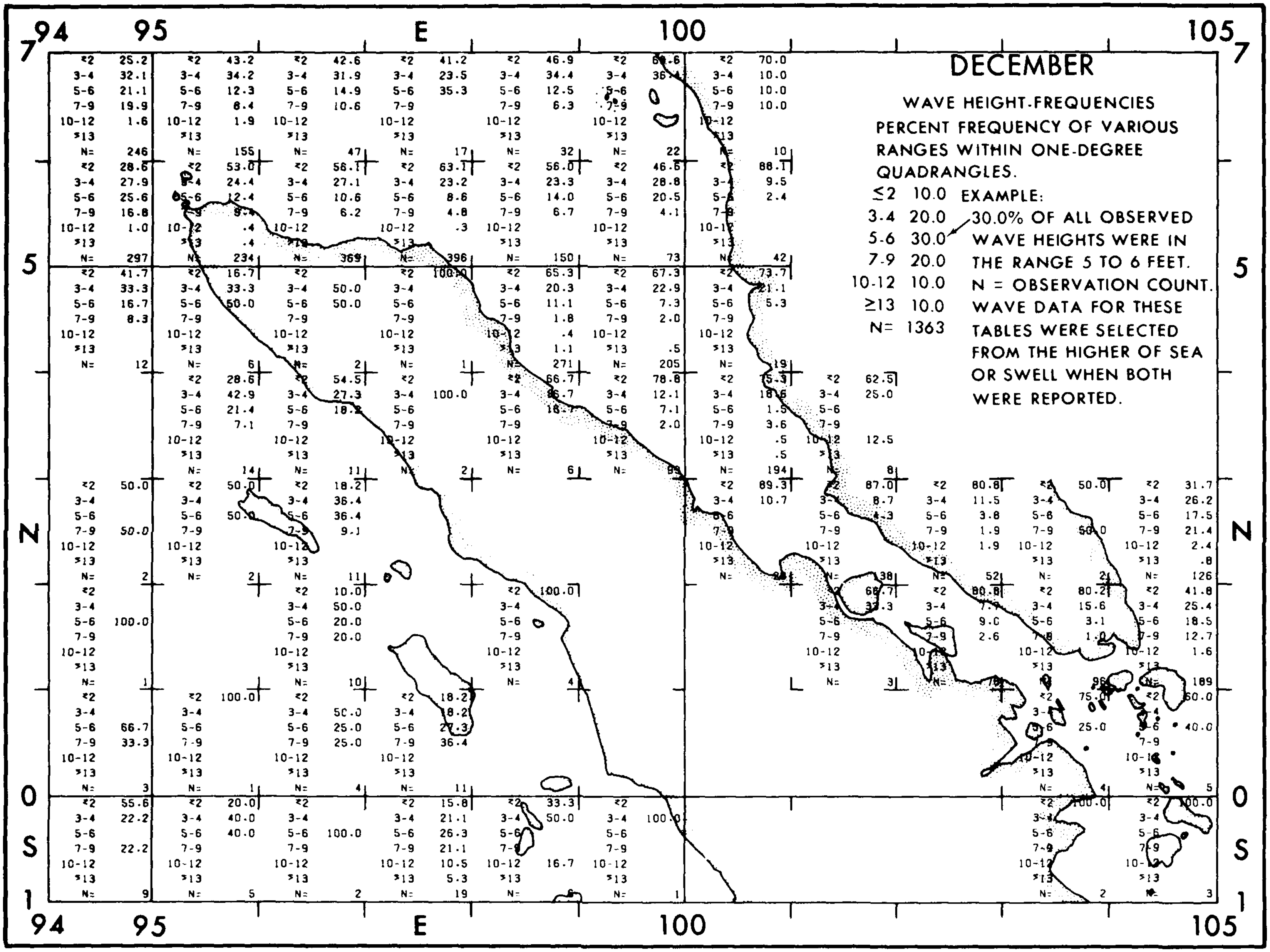

DECEMBER
SURFACE WIND ROSE
99
100
105
110
E
2
5
10



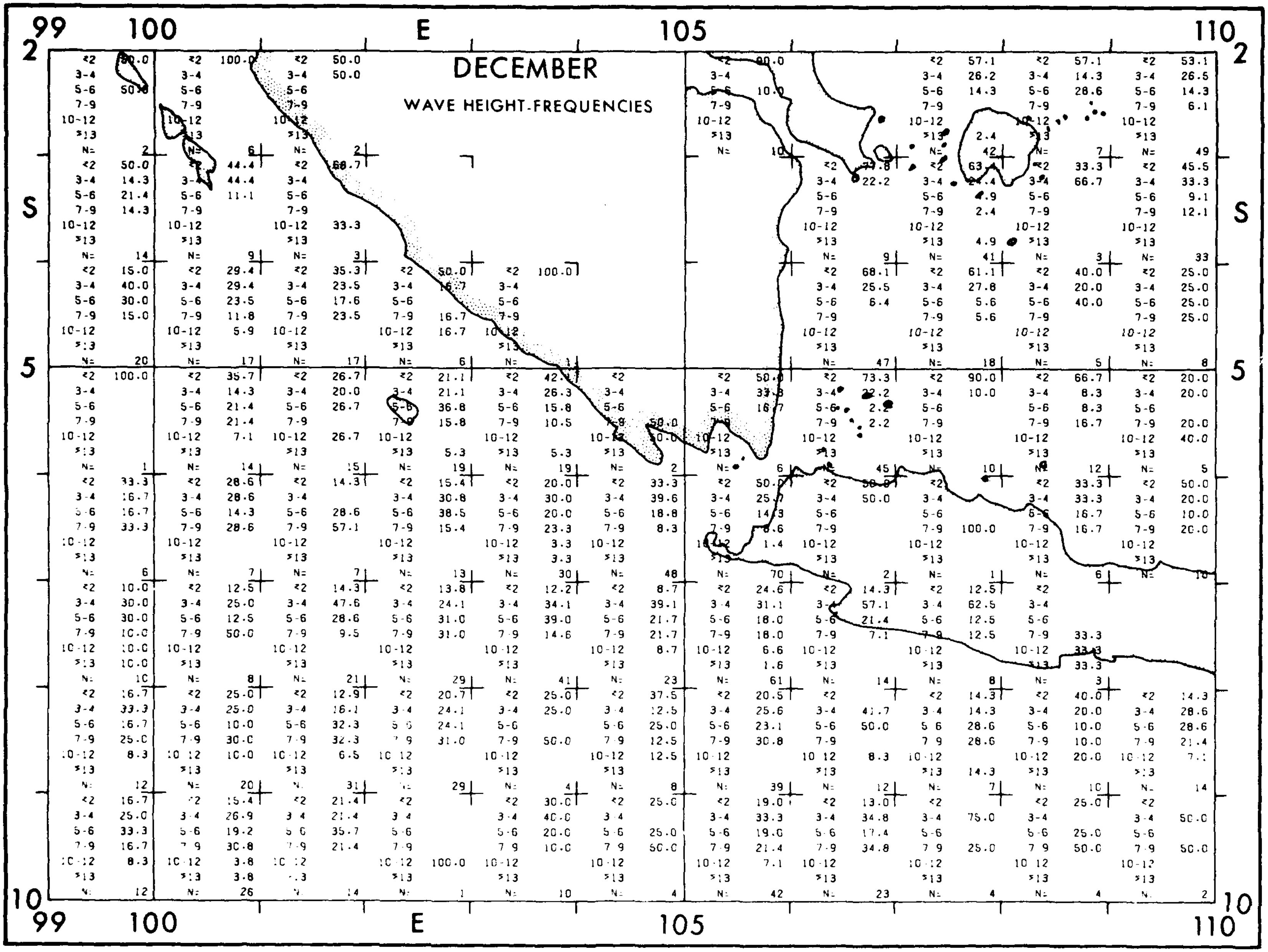
CONVERSION TABLE

°C	°F
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0
36	96.8
37	98.6
38	100.4
39	102.2


DECEMBER
WAVES
SOLID LINE Percent frequency of wave height ≥3 feet
DASHED LINE Percent frequency of wave height ≥8 feet
Wave direction and height
Direction frequency (top scale): Bars represent percent frequency of waves from each direction
Height frequency (bottom scale): Printed figures represent percent frequency of wave heights observed from each direction
(5% of all waves were from the N)
indicates < 5% but >0
(1% of all waves were from the S with heights from 6-7.5 meters)
Number of observations
(2% of the waves from all directions had heights ≥10 meters)
WAVE HEIGHT INTERVAL
Feet 0-2 3-6 7-9 10-12 13-19 20-25 26-32 ≥33
Meters 0-.5 1-1.5 2-2.5 3-3.5 4-5.5 6-7.5 8-9.5 ≥10
Printed scale on bottom of chart
WAVE HEIGHT METERS
92
95
100
105
107
110
112
E
N
S
0
5
10
1
2
3
4



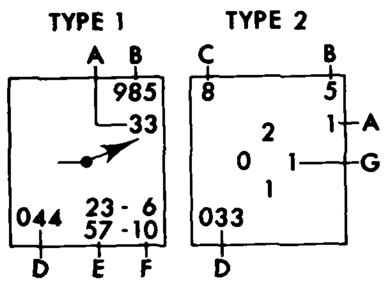
DECEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
94
95
E
100
105
7
5
N
0
S
1


DECEMBER
WAVE HEIGHT-FREQUENCIES
99
100
E
105
110
2
S
5
10

SURFACE CURRENTS

Data Presentation

The following legend shows two types of surface current presentations by 1° quadrangle, type 1 with 12 or more observations and type 2 with fewer than 12 observations. Where there are 11 or fewer observations within a 1° quadrangle, the total number of observations is shown within the 90° quadrant containing the observations.



A Number of calms (included in total observations).

B Total observations

C Mean speed (0.8 knot) for all observations.

D Vector resultant direction (°T) for all observations.

E Percent frequencies (57% primary direction, 23% secondary direction).

F Mean speeds (1.0 knot primary direction, 0.6 knot secondary direction).

G Number of observations by quadrant.

Type 1 - If there are 12 or more non-calm observations in a 1° quadrangle, the surface current is depicted by vector resultants as follows:

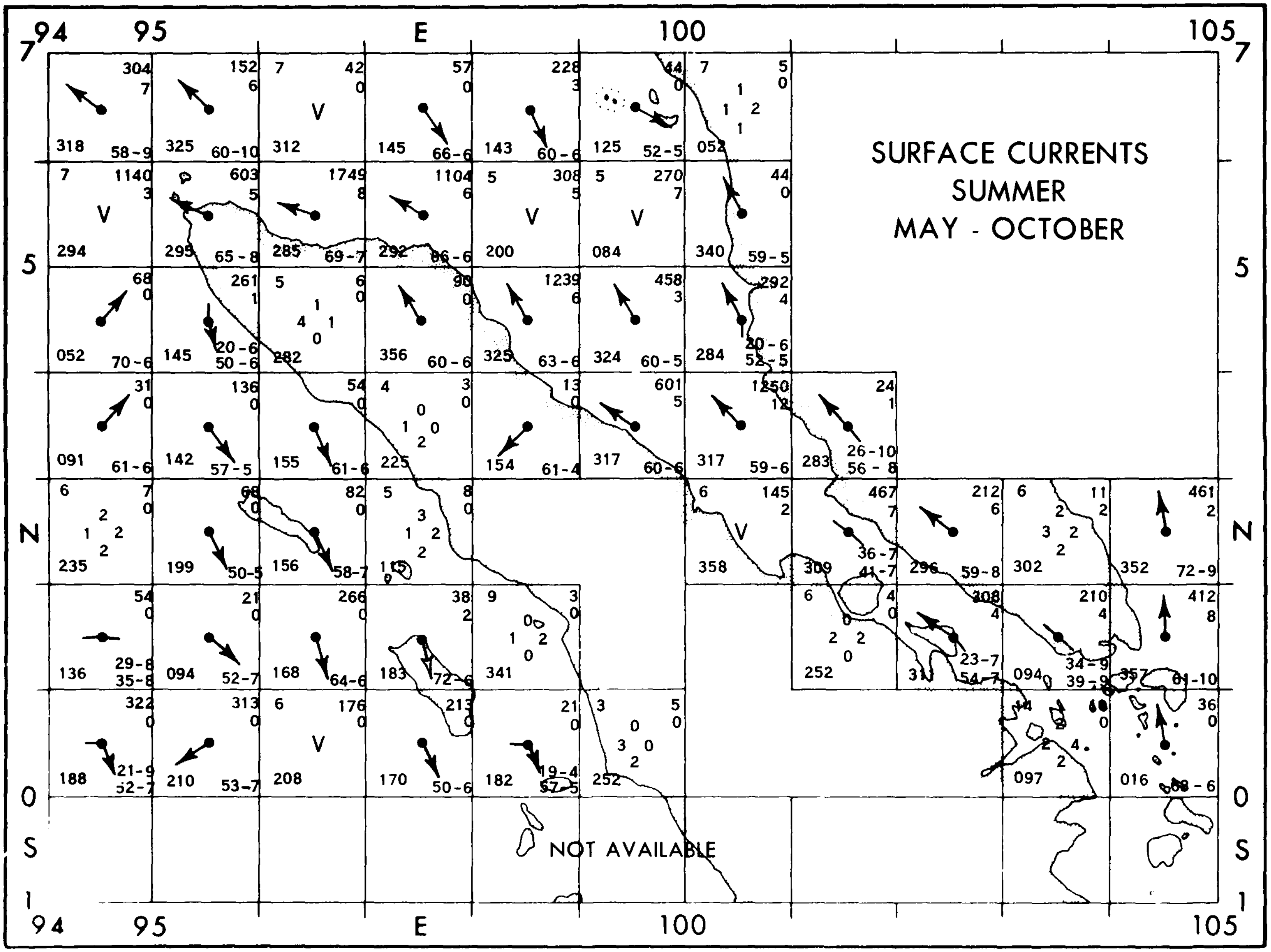
Persistent Current - 60 percent or more of all observations fall within a 45° sector of the 8-point compass.

Primary Current with Secondary Direction -
Primary Current - 50 percent or more of all observations fall within three adjacent 45° sectors.
Secondary Direction - 20 percent or more of all observations fall within a 45° sector, and the two resultant vector directions are separated by more than 90° of arc.

Prevailing Current - 70 percent or more of all observations fall within two adjacent 45° sectors.

Bizonal Flow - Practically all observations are concentrated in opposite pairs of 45° sectors, and one pair contains at least 80 percent as many observations as the opposite pair. This generally indicates variability that occurs in zones of entrainment between opposing currents.

V Variable Current - The 45° sector with most observations has less than 25 percent of all observations; direction is indeterminate.

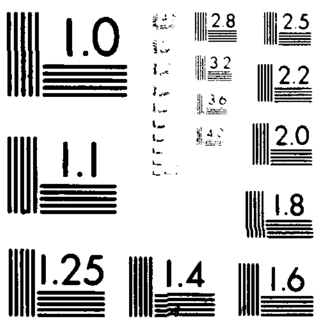

SURFACE CURRENTS
SUMMER
MAY - OCTOBER
NOT AVAILABLE

AD-A115 323 NAVAL OCEANOGRAPHY COMMAND DETACHMENT ASHEVILLE NC F/6 4/2
CLIMATIC STUDY OF THE MALACCA AND SUNDA STRAITS, NEAR COASTAL Z--ETC(U)
APR 82

UNCLASSIFIED NL

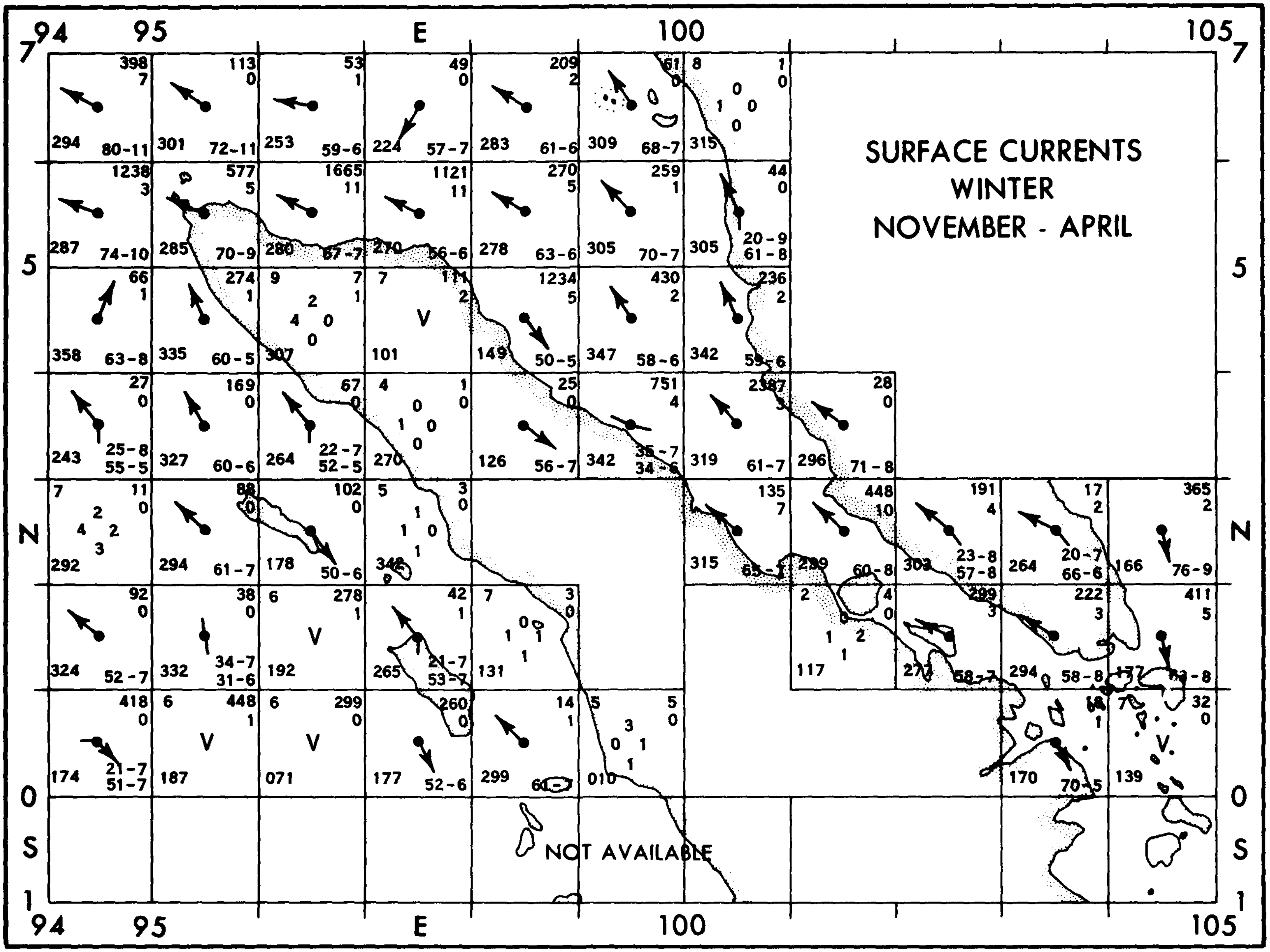
3 of 3
AD A
115 323

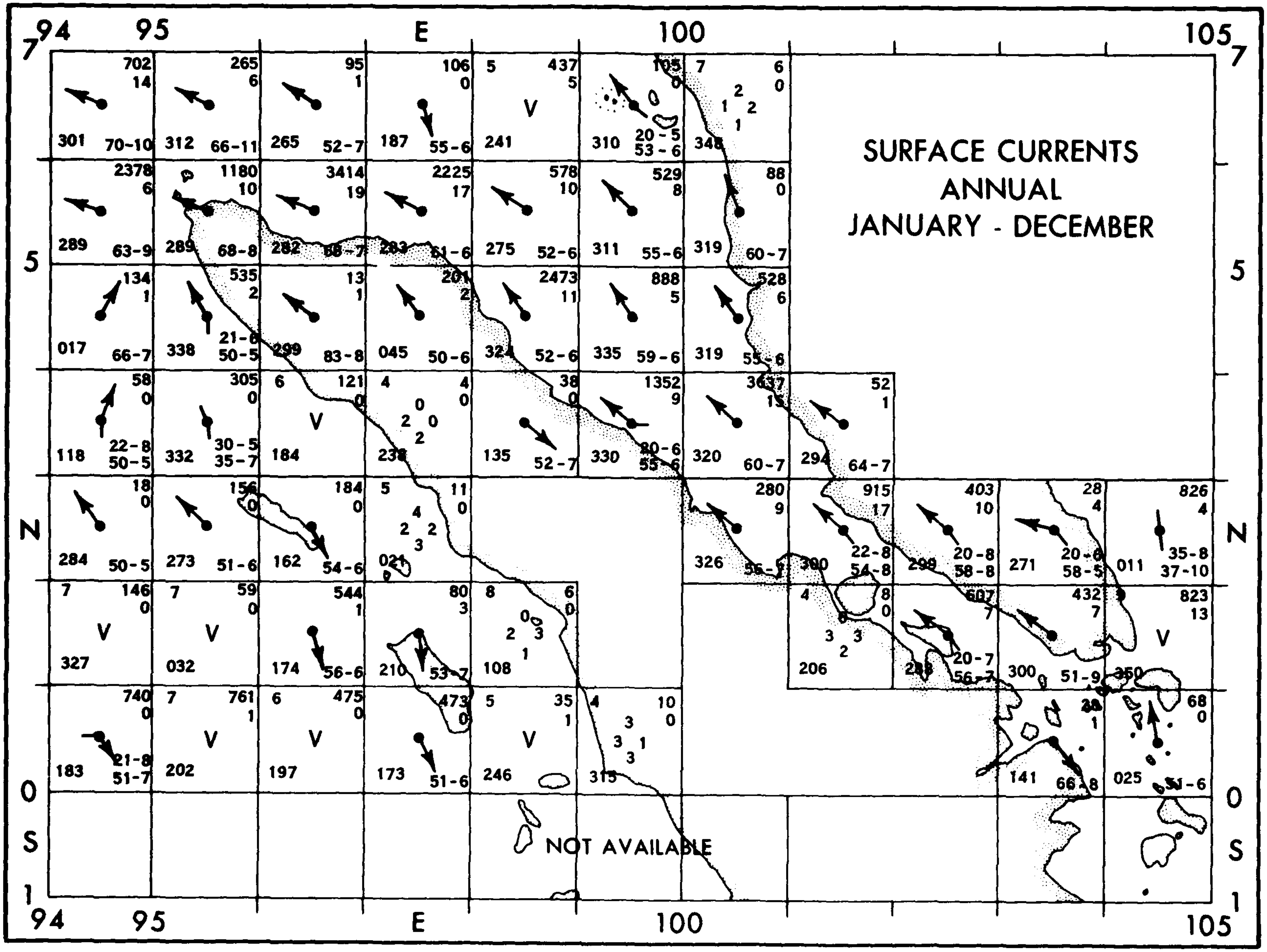
END
DATE
FILMED
07-82
DTIC

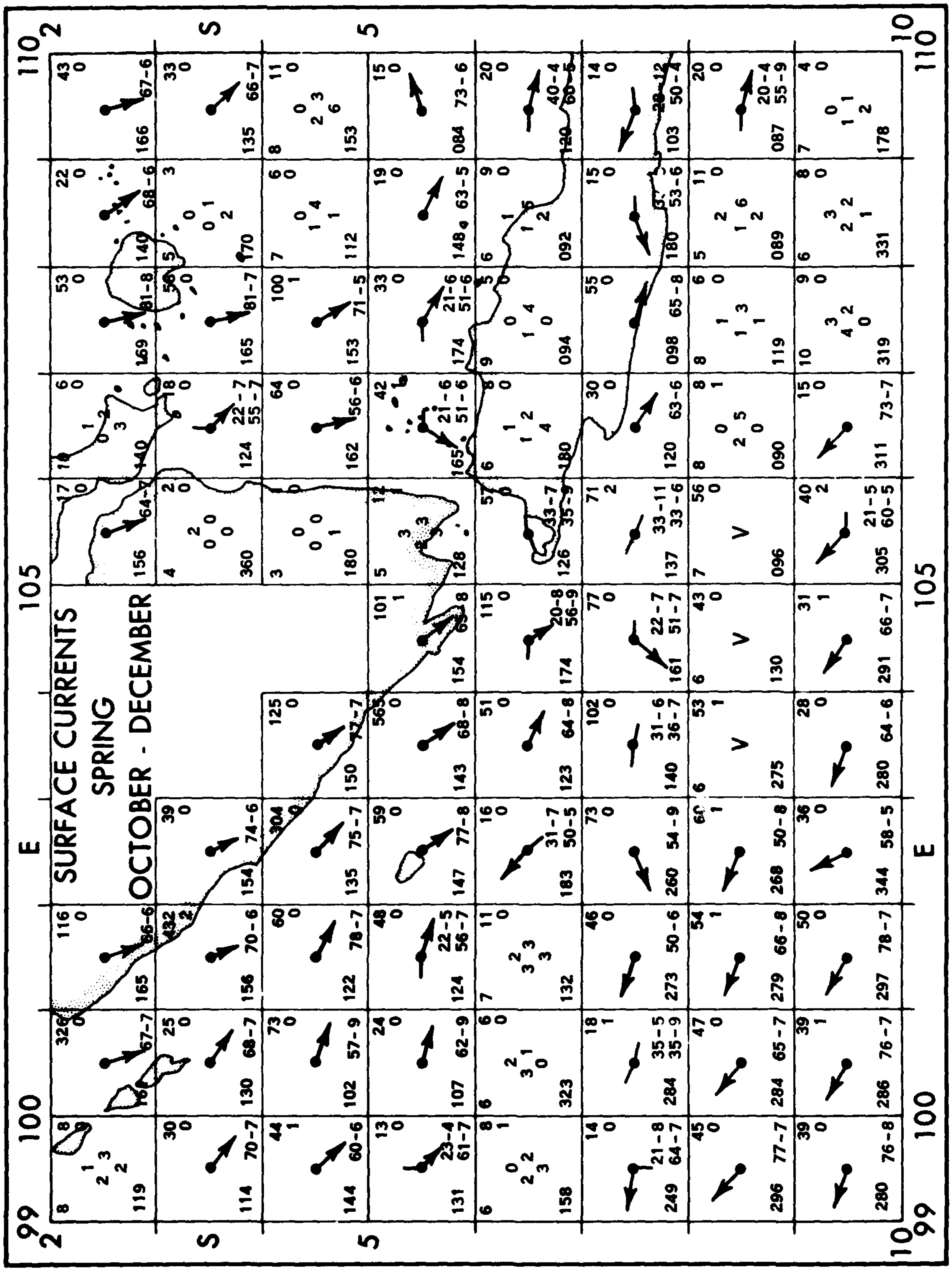


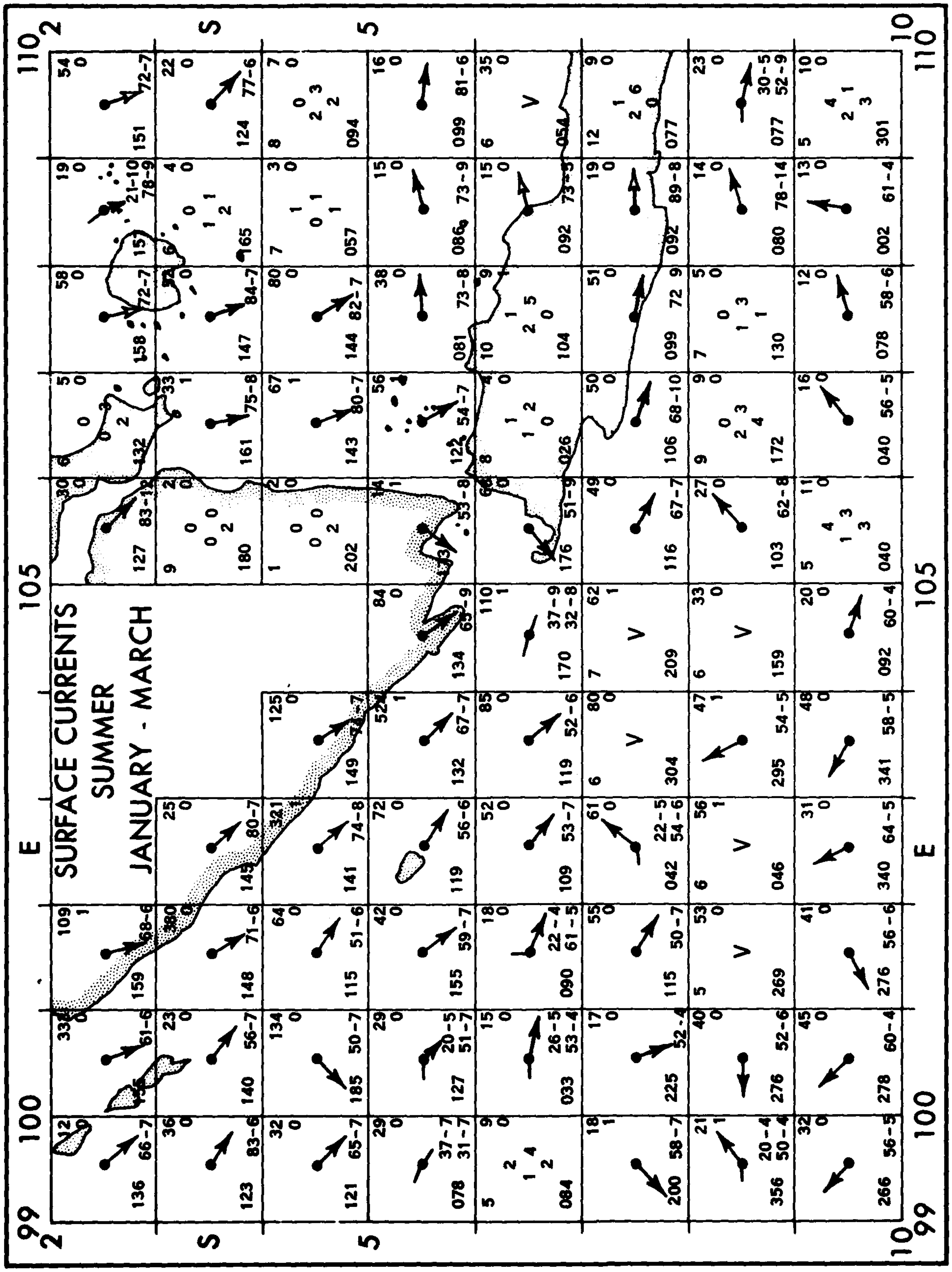
MICROCOPY RESOLUTION TEST CHART

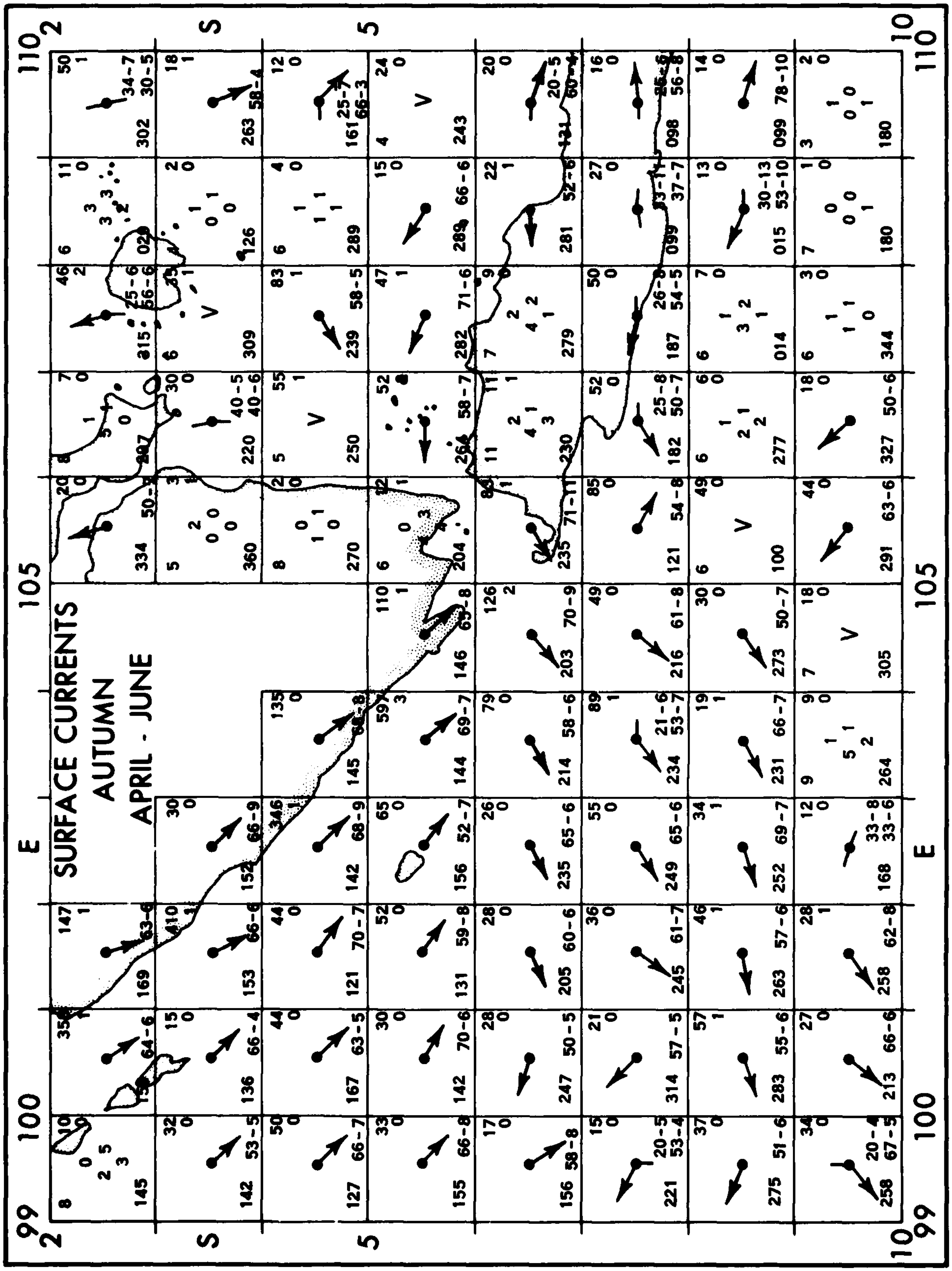
NATIONAL BUREAU OF STANDARDS-1963-A

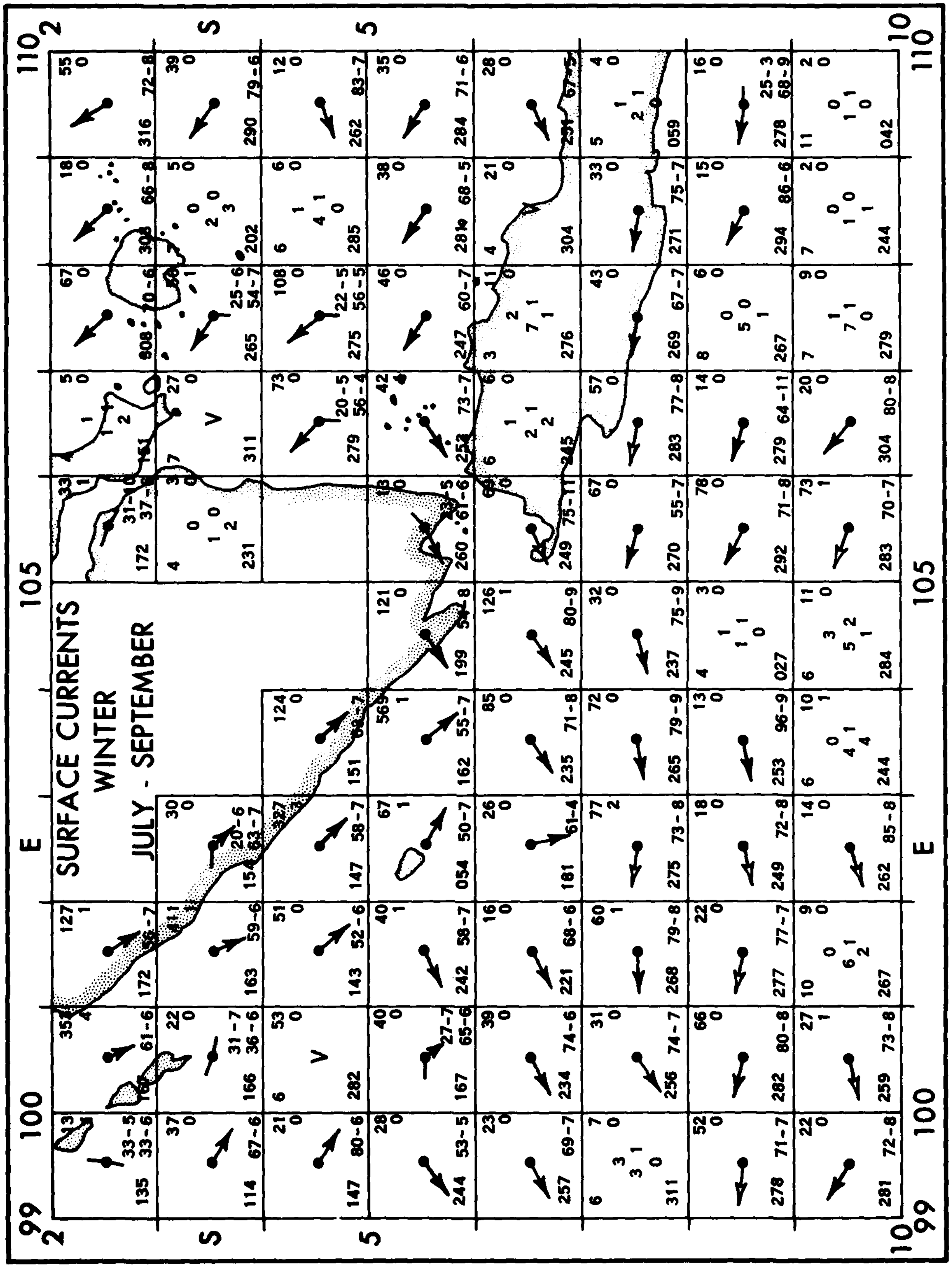

SURFACE CURRENTS
WINTER
NOVEMBER - APRIL
94
95
E
100
105
7
5
N
0
S
1
NOT AVAILABLE

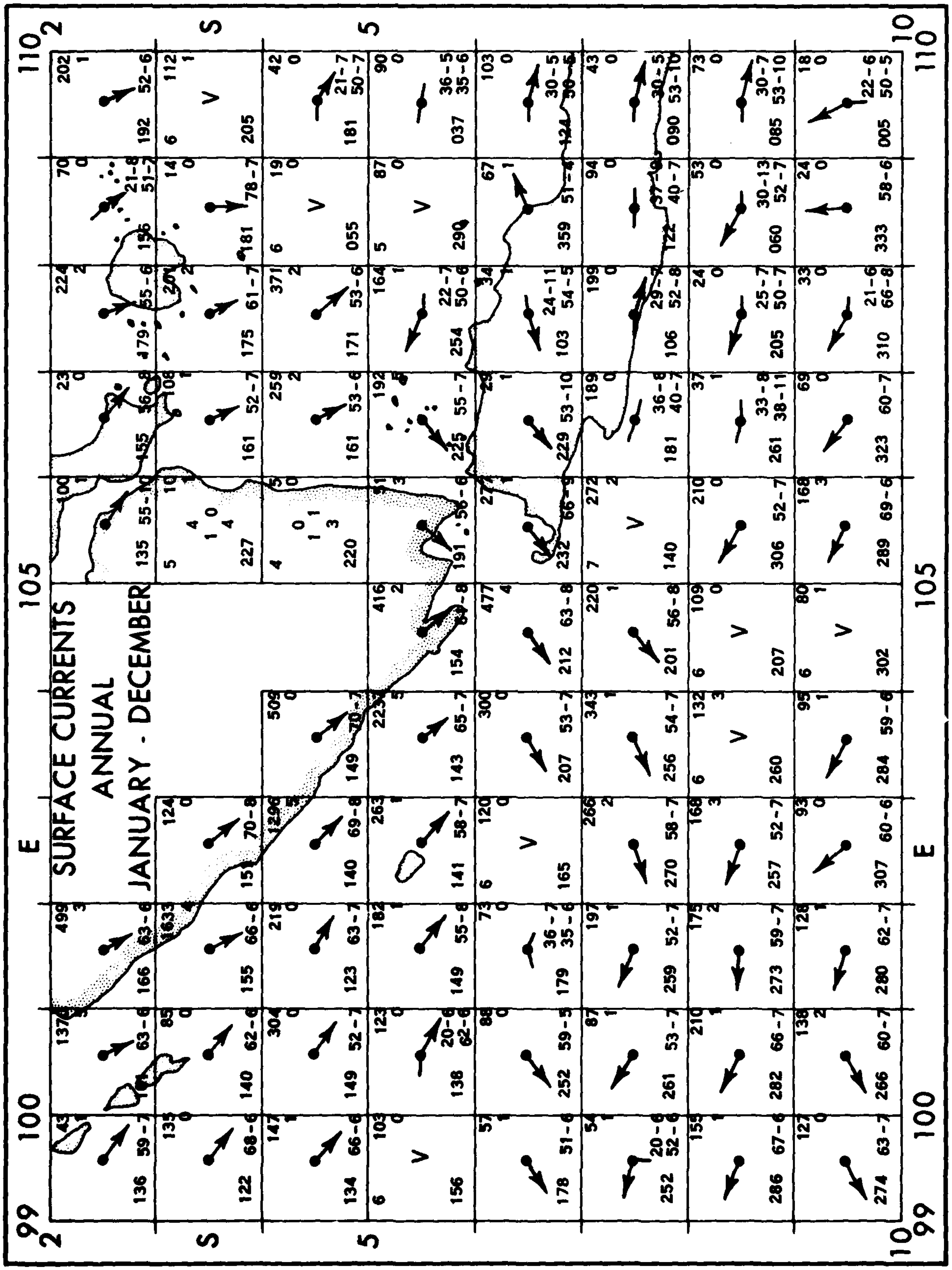

SURFACE CURRENTS
ANNUAL
JANUARY - DECEMBER
NOT AVAILABLE


SURFACE CURRENTS
SPRING
OCTOBER - DECEMBER
99
100
105
110
E
S
5
2
10


SURFACE CURRENTS
SUMMER
JANUARY - MARCH


SURFACE CURRENTS
AUTUMN
APRIL - JUNE


SURFACE CURRENTS
WINTER
JULY - SEPTEMBER



USCOMM-NOAA-ASHEVILLE, N.C. 5/82/250

ATE

LMED

-8